Appendix D-1 - Stream Mile Representation Framework Overview

South Platte Basin Implementation Plan Memorandum

TO:	South Platte Basin and Metro Roundtables’ Environmental and Recreational Subcommittee
	West Sage Water Consultants
FROM:	Steve Malers (Open Water Foundation)
DATE:	March 31, 2015
RE:	Stream Mile Representation Framework Overview

Introduction

This memorandum provides an overview of the Stream Mile Representation Framework (SMRF) approach that has been implemented for the South Platte Basin Implementation Plan (BIP). Earlier drafts of this memorandum were provided to Colorado Division of Water Resources staff and others to vet the approach. This memorandum provides an overview of the approach that was implemented for the BIP and other memoranda describe details of that approach.

Statewide Water Supply Initiative (SWSI) Nonconsumptive Needs Assessment (NCNA) Review and Limitations

During Phase 1 of the South Platte BIP, the consulting team attempted to utilize previous SWSI NCNA data products, including Geographic Information System (GIS) layers, NCNA Microsoft Access database, and spreadsheets. This effort identified significant limitations in the data and approach, which posed barriers to using the SWSI data products for BIP analysis:

- Spatial data utilized the National Hydrograph Dataset (NHD) as the stream layer onto which other data were referenced. The NHD “COMID” identified was used as a database unique identifier for stream reaches and database relationships. The use of COMID has the following limitations:
    - Stream segments represented in data are limited to the NHD digitized segments, which have arbitrary lengths
    - COMID is not recommended for user-facing data because values are volatile and may change in different NHD versions
    - COMID is not present in more recent versions of NHD and therefore there is a lack of continuity between legacy SWSI NCNA data and new work
- Work products based on GIS typically resulted in PDF maps with colored lines for focus areas, attributes, projects, etc. These maps can be difficult for stakeholders to interpret, especially at a local level.
- Stakeholders generally have access to Microsoft Excel but not GIS or Microsoft Access. Stakeholders generally do not have GIS or database software skills. Consequently, data products ideally should be provided in a more accessible format such as Excel, Google Earth, and similar.
- Attempts to show tabular lists of data queried from GIS and the Microsoft Access NCNA database resulted in long Excel lists that did not have context for stakeholders and were disconnected from the spatial representations (maps). For example, project lists did not have

data that were clear to stakeholders and therefore data were difficult to quality control and update.

- Projects and methods meant to indicate protections did not actually indicate true protection in the river (wet water). For example, a segment of the river with an instream flow may receive no additional water due to senior consumptive rights having first right to the water. Analysis of the river must analyze measured or estimated streamflow at specific locations in order to determine how well environmental flow requirements are being met.
- Previous data analysis was based on GIS and/or Microsoft Access database queries that resulted in aggregated results such as “focus area X is 100 miles long and 30 miles have adequate productions for attribute Y”. These results are difficult to relate to local stream reach conditions necessary to produce measureable outcomes.

A new Stream Mile Representation Framework approach was implemented in order to overcome the above issues and also allow analysis of goals and measurable outcomes. The approach was vetted in concept through numerous conversations with stakeholders and subsequently was recommended to the South Platte/Metro Nonconsumptive Needs Committee on Oct 28, 2014. Based on positive feedback, the approach was implemented in the South Platte BIP Phase 2 in early 2015, focusing on several example areas that are discussed in the BIP. The remainder of this document provides an overview of the new SMRF approach.

Stream Mile Representation Framework Concept

The fundamental concept of the SMRF approach is to represent the river as relatively short segments that allow for reasonable precision for visualization and analysis, in particular to represent multiple data layers in an overlapping fashion. A .1-mile segment length was chosen based on review of other efforts and feedback from stakeholders. In the final output, each river or stream is represented as a column in Excel and each row corresponds to the .1-mile segment. Additional columns in Excel represent data layers such as focus area, environmental and recreational (E&R) attributes, project and methods, etc. Figure 1 illustrates the SMRF Excel workbook resulting from the BIP project, in this case highlighting the Saint Vrain Creek example area.

	A	B	C	D	E	F	G	H	I	J	L	O	P
1	GNIS_ID	GNIS_Name	GNIS_ID_FMEAS	FMEAS	TMEAS	Geographic	FocusArea	Type	Rationale	Foc	BaldEagle	BrassyMinnow	ComGarterSnake
861	00205012	Saint Vrain Creek	00205012_025.2	25.2	25.3	Northern	Saint Vrain	Environmental	Habitat fo	17		Yes	
862	00205012	Saint Vrain Creek	00205012_025.3	25.3	25.4	Northern	Saint Vrain	Environmental	Habitat fo	17		Yes	
863	00205012	Saint Vrain Creek	00205012_025.4	25.4	25.5	Northern	Saint Vrain	Environmental	Habitat fo	17		Yes	
864	00205012	Saint Vrain Creek	00205012_025.5	25.5	25.6	Northern	Saint Vrain	Environmental	Habitat fo	17		Yes	
865	00205012	Saint Vrain Creek	00205012_025.6	25.6	25.7	Northern	Saint Vrain	Environmental	Habitat fo	17		Yes	
866	00205012	Saint Vrain Creek	00205012_025.7	25.7	25.8	Northern	Saint Vrain	Environmental	Habitat fo	17		Yes	
867	00205012	Saint Vrain Creek	00205012_025.8	25.8	25.9	Northern	Saint Vrain	Environmental	Habitat fo	17		Yes	
868	00205012	Saint Vrain Creek	00205012_025.9	25.9	26.0	Northern	Saint Vrain	Environmental	Habitat fo	17		Yes	
869	00205012	Saint Vrain Creek	00205012_026.0	26.0	26.1	Northern	Saint Vrain	Environmental	Habitat fo	17		Yes	Yes
870	00205012	Saint Vrain Creek	00205012_026.1	26.1	26.2	Northern	Saint Vrain	Environmental	Habitat fo	17		Yes	Yes
871	00205012	Saint Vrain Creek	00205012_026.2	26.2	26.3	Northern	Saint Vrain	Environmental	Habitat fo	17		Yes	Yes
872	00205012	Saint Vrain Creek	00205012_026.3	26.3	26.4	Northern	Saint Vrain	Environmental	Habitat fo	17		Yes	Yes
873	00205012	Saint Vrain Creek	00205012_026.4	26.4	26.5	Northern	Saint Vrain	Environmental	Habitat fo	17		Yes	Yes
874	00205012	Saint Vrain Creek	00205012_026.5	26.5	26.6	Northern	Saint Vrain	Environmental	Habitat fo	17		Yes	Yes
875	00205012	Saint Vrain Creek	00205012_026.6	26.6	26.7	Northern	Saint Vrain	Environmental	Habitat fo	17		Yes	Yes
876	00205012	Saint Vrain Creek	00205012_026.7	26.7	26.8	Northern	Saint Vrain	Environmental	Habitat fo	17		Yes	Yes

Figure 1. Example of Stream Mile Representation Framework Excel Worksheet (only a few columns are shown)

APPENDIX D – 1 – Stream Mile Representation Framework Overview

The stream mile is a geographic coordinate system commonly referred to as a linear measure. Instead of X,Y coordinates, reference points such as the state line and stream confluences are used for the zero coordinate and distance is measured upstream from these points. Using this coordinate system requires standardized linework representing the streams because all other data are referenced to this linework. Fortunately, DWR staff recently produced a stream data layer called the Source Water Route Framework (SWRF) which uses linework from NHD data and uniquely identifies significant water source streams in Colorado. See: http://cdss.state.co.us/GIS/Pages/AllGISData.aspx. The SWRF layer uses the federal GNIS (Geographic Names Information System) identifier for each stream and DWR staff have quality controlled the data for Colorado. For example, "Saint Vrain Creek" is a single line in the data layer, rather than many short lines in the original NHD. The SWRF layer was used as the basis for all linework in the BIP SMRF approach. For more information about the SWRF, see the DWR memorandum "Source Water Route Framework and Stream Mile Processing", December 2014.

The SMRF has the following benefits:

- The river can be represented in a simple tabular format in Excel
- Input data layers can be collected and managed using normal practices – using the data in the stream mile analysis involves steps explained in this document but do not impact stakeholder management of the original data
- River segments are identified with stream (river) identifier, name, and stream mile, rather than abstract data like "COMID" or other internal GIS data
- Overlapping data layers are clearly indicated as columns and values within columns
- Analysis of each row/segment can occur with simple Excel formulas using agreed-upon metrics and science-based analysis
- Stakeholders that have familiarity with a stream reach can focus on everything that is occurring in that reach, rather than trying to extract analysis results for their reach from complex data queries
- The framework supports inclusion of organizational jurisdictional extent and master plan extent, which will allow integration of local planning and project efforts with other data
- Additional features can be placed on the river by assigning a stream mile either by processing with GIS similar to the BIP Phase II processing or by adding directly to the Excel workbook
- The stream mile can be recalculated if new input are made available (such as new version of SWRF layer from DWR)
- A variety of spatial data layers can be assembled to create the Excel file

Limitations of this representation are:

- Using .1-mile segments is arbitrary and introduces some error in analysis; however, many data layers are imprecise, and tenths of a mile precision have been used elsewhere with success (e.g., Colorado and San Juan Fish Recovery Programs, transportation mileage)
- Intermediate features that do not fall at .1-mile boundaries will not be precisely located for analysis, although precise locations can be indicated in the output (this has been done for stream gages and diversions)
- Changes in the stream layer that is used as a basis for the stream miles, for example due to a stream channel moving from a flood, will cause the stream miles to be different in the future – this is viewed as part of normal data maintenance and the stream miles in the analysis are used to align data, not as an absolute framework

Stream Mile Representation Framework Overview

The SMRF implemented for the South Platte BIP Phase II project is illustrated in Figure 2 below. The SMRF represents streams as .1-mile segments, with overlapping environmental and recreational (E&R) attributes, projects and methods, and other data. This approach allows a large amount of data to be spatially represented in Excel to .1-mile resolution, which allows E&R stakeholders to visualize data local to a stream reach of interest, and perform analysis.

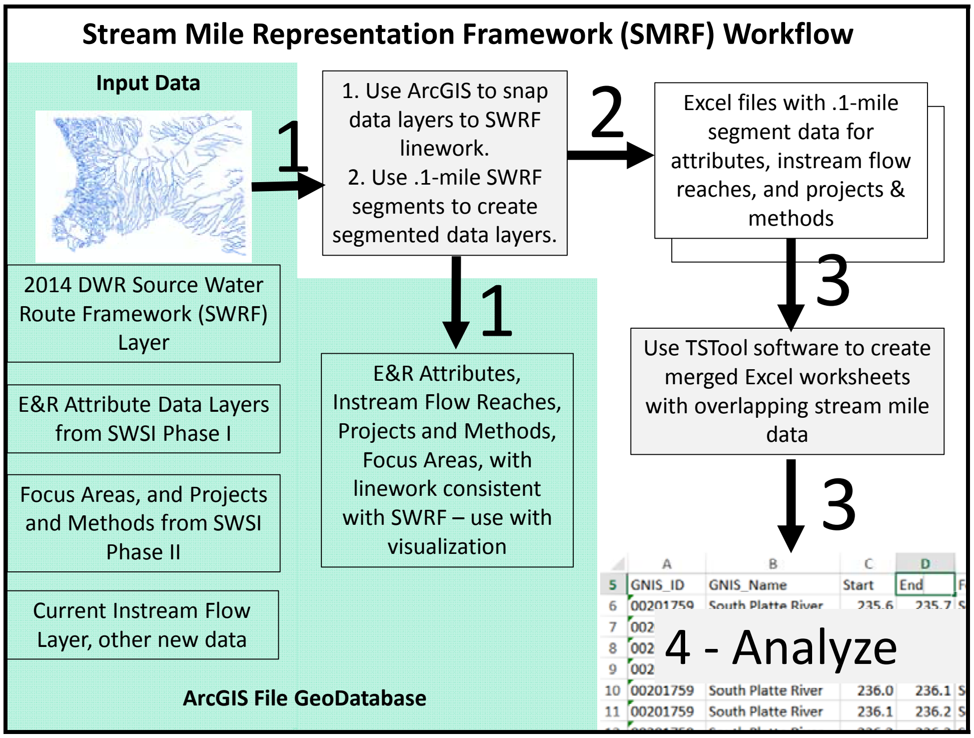


Figure 2. Stream Mile Representation Framework Workflow Overview

ArcGIS software is used in steps 1 and 2 in Figure 2 to manage and process spatial data from multiple sources. GIS processing is described in the BIP memorandum "Stream Mile Representation GIS Workflow Processing," March, 2015. Spatial data used in the analysis were inventoried in an Excel workbook, managed in an ArcGIS file geodatabase, and include the following:

- DWR SWRF layer
- all of the original data layers from the SWSI NCNA Phase I and II efforts, including focus areas, E&R attributes, and projects and methods
- recent instream flow reach layer from the CWCB
- historical and real-time stream gage locations from HydroBase
- key diversion structures, from HydroBase

The SWRF layer and "mile marker" layer showing .1-mile segments were also exported in KML format for visualization and to provide a reference to demonstrate how stakeholder data can be included. Figure 3 illustrates such data for the Saint Vrain example area, from a simple Google Maps prototype.

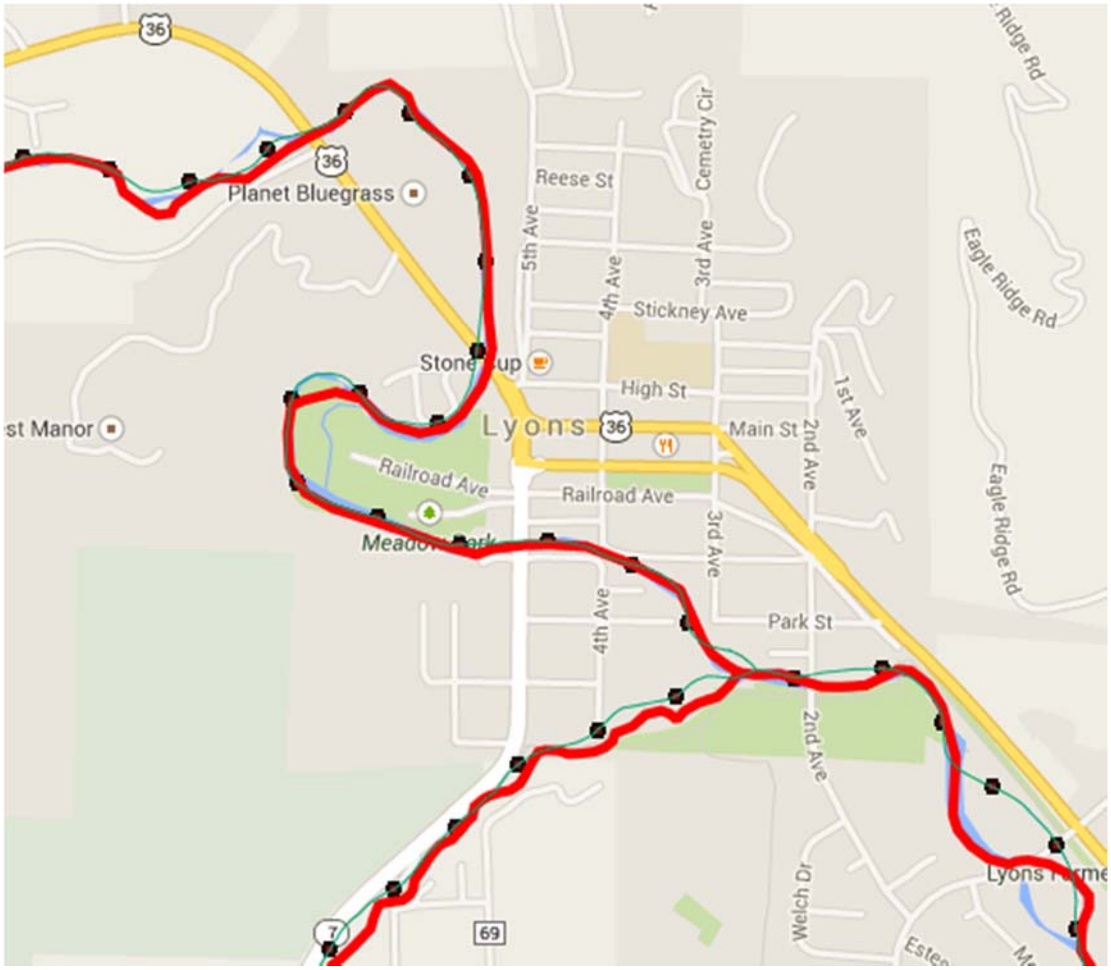


Figure 3. Example of SMRF data layers (circles represent .1-mile segment endpoints)

TSTool software developed for Colorado's Decision Support Systems (CDSS) was used for step 3 in Figure 2 to assemble spatial data tables into the final Excel workbook as shown in Figure 1. The TSTool process is described in the BIP memorandum "Stream Mile Representation Framework TSTool Workflow Processing", March 2015. GIS data layers that were intersected are detailed in the attached data inventory table.

The result of the GIS and TSTool processes is an Excel workbook (step 4 in Figure 2) that includes E&R data, where rows represent .1-mile stream segments and columns are included for E&R attributes, instream flow reaches, projects and methods, locations of stream gages and diversion structures, and other data, as illustrated in Figure 1.

The BIP results provide a framework for visualizing and understanding E&R data, and providing a platform for analysis. For example, daily streamflow time series can be analyzed to determine if available "wet water" is meeting the flow requirements for E&R attributes. The SMRF provides a platform to spatially represent E&R requirements at a local level to represent a variety of E&R data along stream reaches. This framework can be enhanced and applied to further understand E&R

requirements and the challenges in meeting those requirements at a local scale. The framework can also provide a means for stakeholders to provide input, as described in the BIP memorandum "Stream Mile Representation Framework Stakeholder Data Input", March 2015.

Comments and Recommendations

The SMRF implemented for the South Platte BIP provides a framework to represent E&R attributes, master plans, projects and methods, and other spatially-referenced data. Although this framework does require GIS and other processing to create data that are merged into the baseline SMRF Excel workbook, the concepts used in the SMRF, and the format of the Excel workbook are straightforward and encourage additional of stakeholder data. The following specific recommendations are made:

1. **Scale SMRF to wider area**. The BIP project has resulted in a SMRF that demonstrates utility in managing and visualizing E&R data. However, the SMRF is a prototype applied to several example areas in the South Platte. It is recommended that the State invest resources to fully implement the SMRF approach throughout the South Platte Basin and perhaps statewide, including:
    a. **Review and enhance SMRF processes.** The BIP effort implemented data processing procedures necessary to meet the BIP deadlines. An entirely new framework was implemented in several months, benefitting from the use of automated procedures. Although normal care was taken when performing the work, additional review should occur before expanding the SMRF approach to a wider area.
    b. **Focus on automation and quality control.** The amount of data included in the SMRF is large. Scaling the approach to a larger area will require that data processing and quality control are automated. Consequently, tools and approaches developed for the BIP effort should be enhanced to ensure that automation continues to be used for the greatest efficiency.
2. **Integrate the SMRF with quantitative analysis of E&R needs and gap**. The SMRF provides a framework to spatially integrate many data types to a .1-mile resolution. This framework can be effective in understanding the relative impacts of water use and projects, in particular to provide a straightforward tool that can be used by stakeholders. However, full understanding of E&R issues will not be possible until "wet water" environmental flow requirements are better understood. Therefore, it is recommended that analysis of streamflow and other data occur and be referenced to the SMRF. Modeling such as Colorado's Decision Support Systems (CDSS) basin models and point flow models could provide estimates of flows at locations intermediate to stream gages and such data could likewise be referenced to the SMRF. The integration of wet water analysis with spatial context to .1-mile resolution will provide a powerful tool for evaluating E&R needs and gaps, and the impacts of projects such as Identified Projects and Processes (IPPs).

Appendix D-2 - Stream Mile Representation Framework GIS Workflow Processing

South Platte Basin Implementation Plan Memorandum

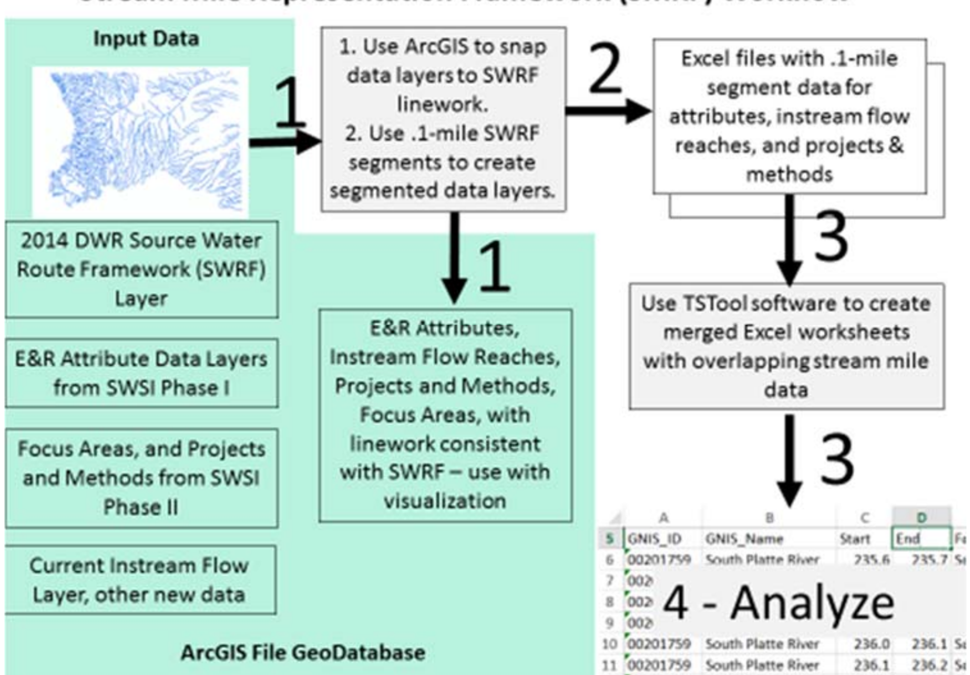
TO:	South Platte Basin and Metro Roundtables' Environmental and Recreational Subcommittee
REVIEWED BY:	West Sage Water Consultants
FROM:	Paul Schwindt (Simple Survey Mapping, LLC) and Steve Malers (Open Water Foundation)
DATE:	March 17, 2015
RE:	Stream Mile Representation Framework GIS Workflow Processing

Introduction

This technical memorandum documents the geographic information system (GIS) work performed in Phase II of the South Platte Basin Implementation Plan (BIP), in particular data processing necessary to create the new Stream Mile Representation Framework (SMRF) to support environmental and recreational (E&R) gap analysis. This document details input data sources, changes to pertinent layers, challenges encountered and how they were handled, technical details of workflows, naming conventions, and locations of output layers. This memorandum includes technical GIS language but also provides general explanations where possible.

The SMRF approach is summarized in the following figure. This memorandum focuses on the data and steps for 1 and 2. The overall concept of the SMRF is to process input data layers such as E&R attributes into a form that can be represented as .1-mile segments using standard stream linework. The .1-mile segments can then be aligned in Microsoft Excel, GIS, and other tools to allow for localized consideration of all spatially-related data. The BIP project has applied this approach for the first time in the context of E&R data analysis.

Stream Mile Representation Framework (SMRF) Workflow



The SMRF approach utilizes the Source Water Route Framework (SWRF) layer provided by the Colorado Division of Water Resources (DWR) for stream linework and stream mile reference. The SWRF is created by processing the National Hydrography Dataset (NHD) into linework that is more relevant to water administration by DWR, is smaller in size than NHD, and easier to use. The SWRF framework greatly simplifies using the linework from NHD and it overcomes technical issues. For example, the NHD layer was used in the Statewide Water Supply Initiative (SWSI) to provide a spatial reference for E&R data. However, this was accomplished by using the NHD "COMID" as the unique identifier for stream segments. COMID is no longer available in current versions of NHD and consequently use of earlier SWSI data referenced to COMID for analysis is challenging. These technical issues contributed to the need to adopt an alternative framework, and the SMRF was created. See the DWR memorandum "Source Water Route Framework and Stream Mile Processing," December 2014 for background on the SWRF layer. The current SWRF layer was not available at the time that the BIP analysis began; however, recent changes are understood to be minor. The layer Strm_Route provided by DWR was used for the workflows. Strm_Route was made available to the BIP Team by DWR in November 2014 and SWRF was not officially released until the end of January 2015. In this document, the SWRF phrase is used to reference the framework, but Strm_Route was identified for that role in the technical details and actually used in the analysis. The terms are mostly interchangeable, but see Appendix D for detailed differences between the layers.

The following discussion involves GIS processing based on two important concepts: "snapping" and "linear referencing". Snapping refers to moving the coordinates of features in one layer to match those of another layer. In the context of the SMRF, snapping is used to move original input data (such as linework for streams different than the SWRF layer) to the SWRF linework from DWR. This ensures that all stream linework is consistent. Linear referencing is the practice of spatially defining features by providing a measure from one end of a line. In other words, a line can be defined as a subset of another line by providing the measures of each end. For the SMRF, snapping and linear referencing are used to align data layers with the DWR SWRF layer such that the stream mile values are also consistent with SWRF and provide a common framework. For the SWRF and SMRF, stream mile is measured upstream from the State line and stream confluences on tributaries.

In the following discussion, it is easy to confuse E&R "attributes" with GIS layer "attribute table". Consequently, verbose language is used to ensure clarity.

1-Construction of the .1-Mile Markers and Segmented SWRF Layers

The SWRF layer provided by DWR is not segmented. Each Geographic Names Information System (GNIS) identifier (ID) corresponds to only one line segment (representing the reach) that spans the entire stream length. To achieve the structure for SMRF, points needed to be created on SWRF linework at .1-mile increments. These points were used for two reasons. First, the ArcGIS software can segment lines using the point locations which results in the segmented linework for the data layers. Second, these points are the "Mile Markers" (spaced at .1-mile increments) containing the distance measurements in the point layer's attribute table. These Mile Markers can be viewed in Google Earth or other viewer when exported, as a reference for locating stakeholder-supplied data.

1.1-Creation of .1-Mile Markers

The workflow to create .1-mile markers uses a simple spreadsheet and linear referencing to construct points at .1-mile increments for the entire SWRF layer. This created ~3.4 million Mile Markers which can be cumbersome to the software and quality control (QC) efforts. To speed up processing, a subset of SWRF was built that only contained reaches included in the South Platte E&R focus areas (FAs). This subset layer is more manageable at ~23,000 features.

- The simple spreadsheet (Figure 1) was compiled by inputting .1-mile (160.9344 meters) increments starting in row 1, and continuing through 3520 (arbitrary number that is longer than any reach in SWRF...the South Platte has more than 3400 .1-mile reaches). Meters were used because they are consistent with the layer's coordinate system, but processing outputs utilize U.S. measures.

	A
1	TenthMiles
2	160.9344
3	321.8688
4	482.8032
5	643.7376

Figure 1

TenthMiles	Strm_Route_	Strm_Route_GNIS_Name
160.9344	00178247	Little James Creek
160.9344	00020001	Brewers Gulch
160.9344	00020002	Hoffman Gulch
160.9344	00020003	Graflin Slough
160.9344	00040001	Carwyle Gulch

Figure 2

- This simple table was used as input to the GIS software to build another table that applied the increments from the input table to each GNIS ID (each stream). See Figure 2.
- This second table was then used as the input for linear referencing. Each row is an "event" along that GNIS stream. A linear referencing tool can then "locate" that event, and create a point feature at the given measurement.

1.2-Creation of .1-Mile Segmented SWRF Layer

This workflow uses the .1-mile marker layer just created and divides the original SWRF layer into .1-mile line segments. The resulting layer is used to intersect with the FA layer to complete the migration of Phase I FAs created with a NHD COMID framework, to a .1-mile segmented layer consistent with SMRF.

2-Construction of Focus Area (FA) Base Layer for BIP Phase II

Early SWSI E&R work utilized spatial data layers for E&R attributes and other data. However, the large amount of spatial data was difficult to manage and review, especially when E&R stakeholders have local interests. Consequently, "focus areas" were defined as a subset of the overall E&R dataset. The rationale for each focus area varies, but, in concept, a focus area is a geographic subset of the stream system that is related to specific E&R attributes. The focus area layer serves as the base layer for BIP Phase II analysis. It retains the extents and attribute table information of FAs determined in BIP Phase I, integrates the DWR standardized linework and reach identification system of the new SWRF layer, and is intersected with E&R attribute extents, Projects and Studies (P&S) on the FA reaches, and instream flow (ISF) reaches. Additionally, the FA layer is segmented into .1-mile segments to be consistent with the SMRF.

2.1-Preparation of the FA Base Layer for Linear Referencing

The initial FA input layer for BIP Phase II work was the final layer from the BIP Phase I work and includes SWSI 2010 focus areas and several new focus areas. This section briefly details the status of the input FA layer, and preparatory steps for linear referencing.

- **Status of the FA layer from Phase I**
  - The initial FA layer contains the FAs finalized in BIP Phase I for the South Platte Basin (Figure 3). Note that some of the reaches seem to have missing segments. The linework in Figure 3 is simply the extent of Phase I FAs, not necessarily a contiguous representation of each reach. These missing segments (light blue linework in Figure 4) were imported from the SWRF linework when migrating the FA extents to SMRF for the Phase II layers. This was done without altering the extents of the FAs and allows for analysis on the outside borders of FAs. Some Phase I FA reaches are not in SWRF and therefore are not included in this FA Base Layer. Data for these excluded areas are still available (notated in Appendix D); however, coordination with DWR to add to the SWRF in the future would ensure consistency.

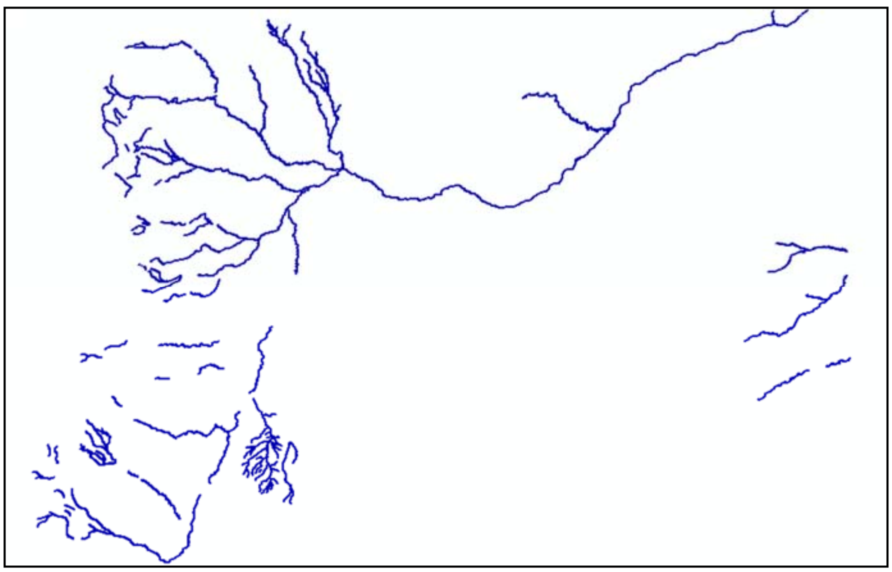


Figure 3. Linework of focus areas from BIP Phase I, based on NHD linework.

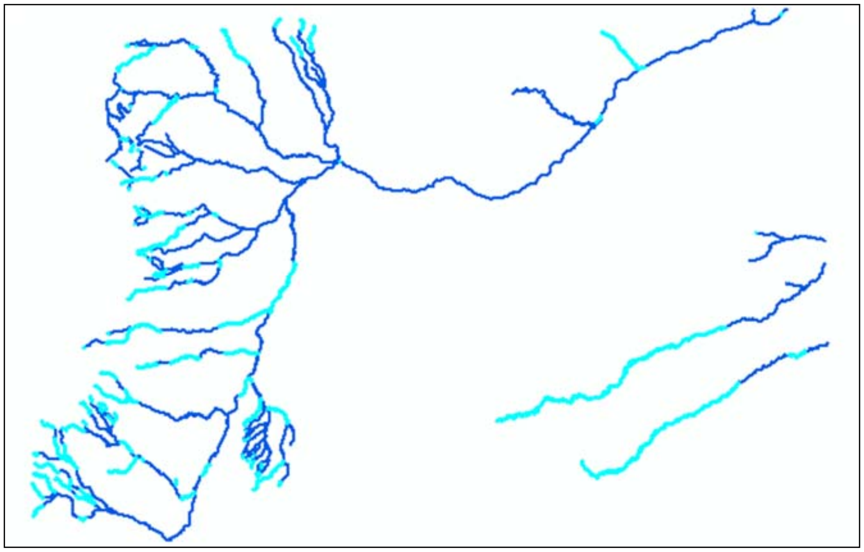


Figure 4. Linework of BIP Phase II focus Areas, based on SWRF Layer (dark blue), and additional SWRF linework to make reaches contiguous (light blue).

- One of the shortcomings of the Phase I FA layer was that the extents of E&R attributes were populated based on NHD COMID which created misrepresentations of habitats because COMID length varied (see Figures 5 and 6).

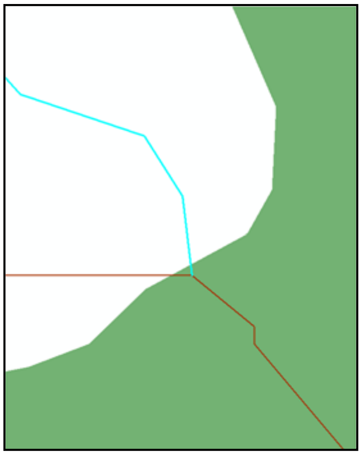


Figure 5

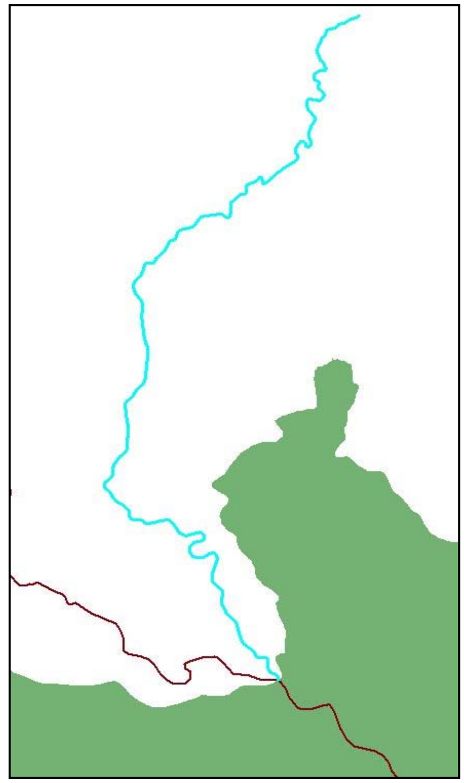


Figure 6

For BIP Phase I FAs, Figure 5 illustrates a case where a COMID line segment overlaps the green, Brassy Minnow Habitat by only 20'. Therefore, all 13,000' of the COMID segment were populated as habitat (Figure 6). With the SMRF, the max overlap is .1-mile (528').

- **Preparatory Steps for Linear Referencing**
  - For the input FA layer, data in the 37 SWSI NCNA "categories" columns were deleted. These column's headings were NOT descriptive and one required a key to decipher their E&R value. New descriptive column headings are added as the individual E&R attribute layers are intersected.
  - GNIS_ID and GNIS_Name columns in the Phase I FA layer were incomplete and were populated appropriately in the Phase II FA layer. These are required for unique identification of the reaches.
  - There are some ArcGIS tools that aid snapping one line to the next, but the input layers provide too much spatial deviation from SWRF to achieve consistent results. Because of this, points were created at the start and end points of all the COMID's linework (Figure 7).

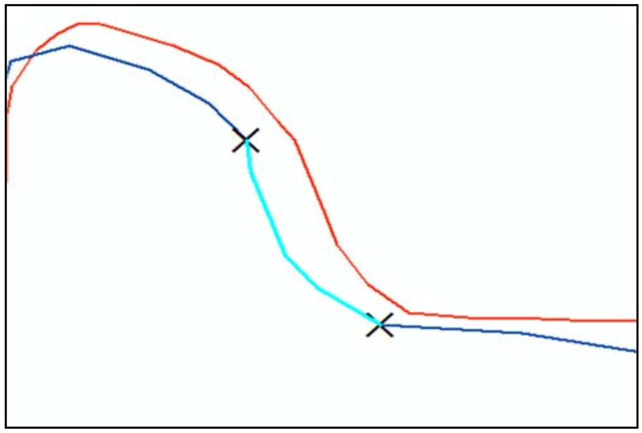


Figure 7. SWRF linework is red, Phase I FA is dark blue, and the COMID extent is light blue. The “X” points represent the start and end of the COMID.

- These points were then transferred (snapped) to the SWRF linework (Figure 8).

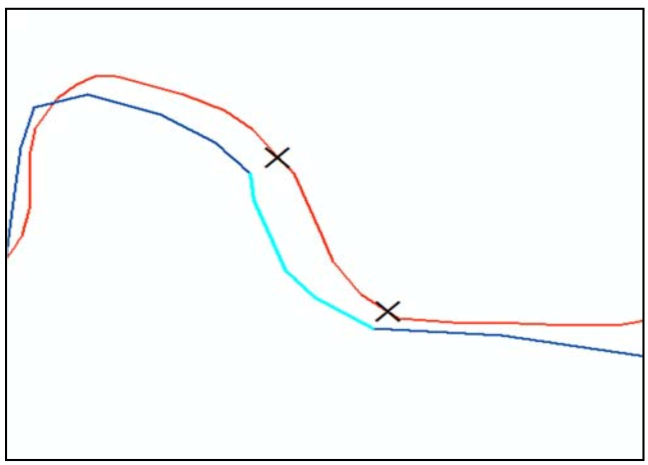


Figure 8. Illustration of snapping start and end points onto SWRF

- The snapping was done in two iterations. The first ensured confluence points were snapped to the appropriate SWRF confluences instead of the stream linework closest to the point (Figure 9). If this confluence point was merely snapped to the nearest reach, a gap in the data would exist between that snapping point and the confluence. The second iteration snapped the remaining points upstream of the confluence to the nearest SWRF reach.
- The snapping procedure cannot account for all spatial layouts representing stream networks. Some input data were outside of the snapping tolerance of the ArcGIS automated tools, and some points were snapped to the incorrect GNIS_ID because the original linework was closer in proximity to the incorrect GNIS in the SWRF (Figure 10). When investigating these limitations, care must be taken manually snapping coincident start/end points. If separated, they will create overlaps or gaps in the resulting data. Once quality controlled (QC), all start/end points are located on SWRF, and are ready to be linear referenced. The workflows in the appendix identify when manual QC work was performed.

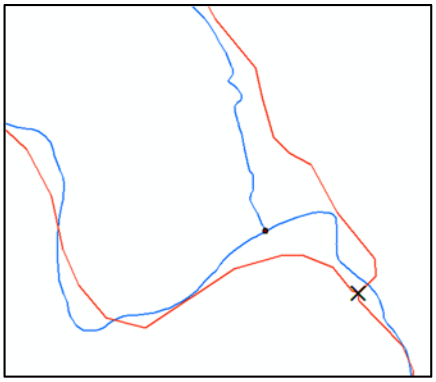


Figure 9. ArcGIS snapping tool would snap the point (X) to the closest blue linework if the confluence was not taken into account, but it clearly needs to snap to the confluence point (•).

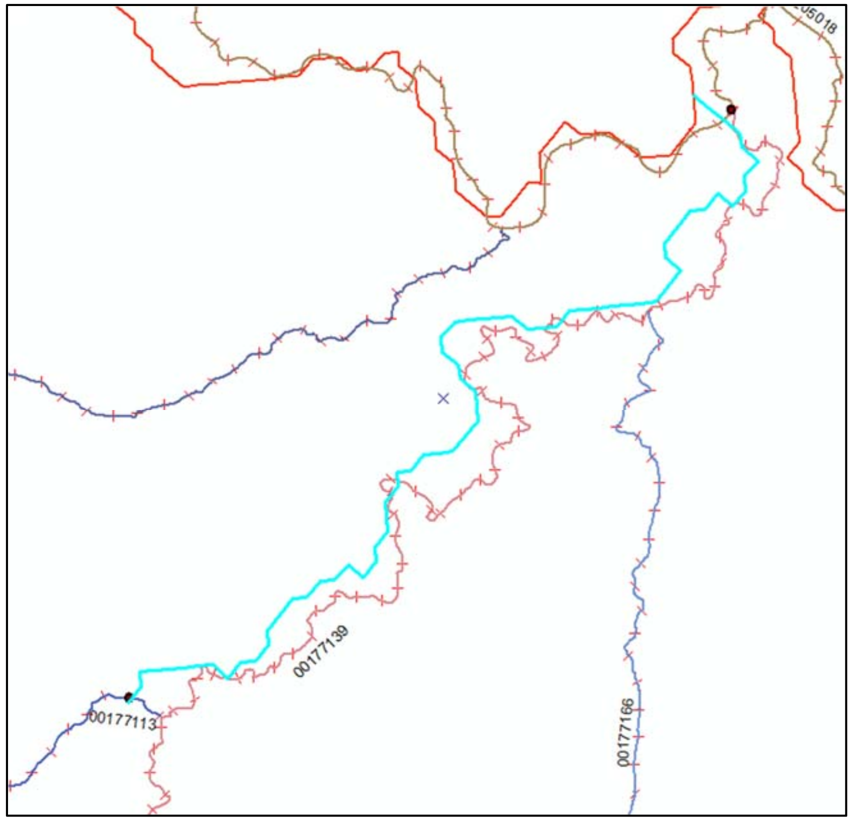


Figure 10. Original E&R linework (light blue line) can deviate greatly from SWRF (hash marked linework). In this case, the endpoint of the light blue line is closest to its tributary's linework, requiring manual QC to clean up.

2.2-Linear Referencing the FA layer

Linear referencing is the process of measuring the distance of an event or feature along a line or route, and recording that measurement. The SWRF layer is organized in actual miles from its confluence (mile 0), to the headwaters (mile x, where x is length of river). DWR incorporated this convention, which provides a useful framework for linear referencing, and for migrating data layers from previous work to the new SWRF linework. With the start and end points transferred to the SWRF linework, they can now be "located" using linear referencing relative to SWRF stream reaches and have the measurements written to the FA attribute table. Geographic coordinates are inherent in GIS when describing features, but measurements along a river or route specified as a linear reference measure need be calculated by processing the linework layer.

- Out of the box tools in ArcGIS (specified in the appendix workflows) perform linear referencing; however, the data needs to be organized for the tools to be effective. These tools add the measures as columns in the data layer's attribute table (Figure 11). FMEAS is the distance from the reach's origin (usually a confluence), to the start point of the .1-mile line segment, and TMEAS is the distance from the origin to the end point of that segment.

GNIS_ID	GNIS_Name	FMEAS	TMEAS	
00201759	South Platte River	161.5	161.6	L
00201759	South Platte River	161.6	161.7	L
00201759	South Platte River	161.7	161.8	L
00201759	South Platte River	161.8	161.9	L
00201759	South Platte River	161.9	162	L

Figure 11. Example of linear reference measures for .1-mile segments.

- The ArcGIS linear referencing tool Make Route Event Layer creates new linework between the start and end point measures that follow the SWRF layer. The newly created linework is identical to SWRF and contains the original attribute table data from Phase I FA layer. The attribute table data retained in the new layer are FA name, segment number (a unique number corresponding to the FA), E&R type, segment description (focus area description), and rationale.

2.3-Finalizing the FA layer

Segmenting the entire SWRF into .1-mile segments creates ~3.4 million features for the layer. To speed up processing and QC, a subset of SWRF was built that only contains reaches overlapped by the FAs. It is more manageable at ~23,000 features and is overlayed with the new FA linework. This overlay finalized the transfer of FA table attributes to the .1-mile segmented, SWRF linework.

3-Intersection of Environmental & Recreational Attributes with Final BIP Phase II FA Base Layer

This workflow determines if E&R attributes are coincident with .1-mile segments corresponding to FAs. If they are coincident, the process indicates so by writing a "Yes" to the FA layer's attribute table for the respective E&R attribute for the .1-mile segment. New, descriptive column headings were added to the FA attribute table to help make each attribute column more explanatory. Compare the headings in Figures 12 (SWSI NCNA Phase II) and 13 (SMRF). The extent of E&R attributes in SWSI was indicated either by Hydrologic Unit Code (HUC) polygon layers, polyline stream layers (e.g., boating reaches), or point layers (e.g., bald eagle nest sites).

categor_25	categor_26	categor_27	categor_28	categor_29	categor
0	0	0	0	0	
0	1	0	0	1	
0	1	0	0	1	

Figure 12. Nondescript column headings of E&R attributes from BIP Phase I spreadsheets and tables.

erness	BaldEagle	BirdArea	BorealToad	BrassyMinnow	ComGarterSnake
	<Null>	<Null>	<Null>	Yes	<Null>
	<Null>	<Null>	<Null>	Yes	<Null>
	<Null>	<Null>	<Null>	Yes	<Null>

Figure 13. Descriptive column headings of E&R attributes for BIP Phase II.

The intersection of E&R attributes for polylines is much more complex than the polygon layers. Similar to the FA base layer workflow, the polyline layers needed to have their start/end points transferred to SWRF to determine their extent. The polygon layers are simply coincident with SWRF reaches, or these reaches are outside of the E&R polygon (see Figure 15).

3.1-Intersection of E&R Attributes (Polylines) and FA Base Layer

The linework of the E&R attributes is significantly different than that of SWRF. Figure 14 displays this characteristic, and deviations in linework as high as a half mile have been found. This is due to the E&R attribute data being digitized from stream data with lower resolution and various agencies creating this input data with no standard process. This complexity presented many scenarios that automation could not account for (especially at confluences), and QC was important for the polyline layers with numerous features.

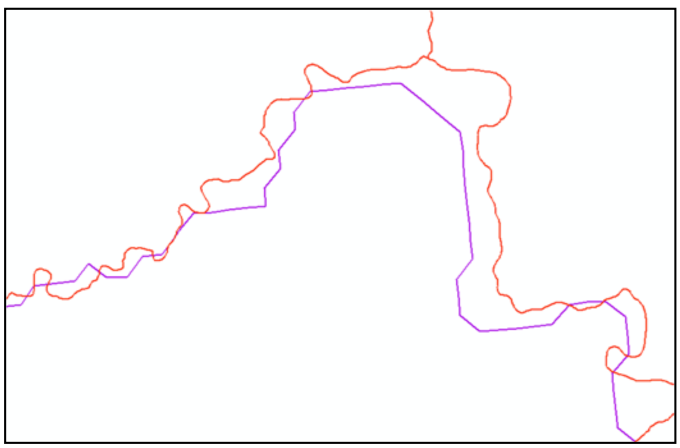


Figure 14. Purple line is the Rafting attribute, and red line is SWRF.

- Similar to the creation of the FA base layer, points were created at the start/end of the attribute's extents defined in their respective layers. However, the input layers had multipart geometry, which complicated this process. This multipart geometry would create unnecessary quantities of start/end points. For example, a single, one mile reach could be comprised of 3 COMID's and would have 3 start and 3 stop points created for the single E&R attribute. Only one start point, and one stop point are needed to define the extent. To simplify the layer in preparation for linear referencing, the layers had the Unsplit Tool executed on them to unsplit their geometry. This part of the workflow created singlepart geometry to define the extent of the E&R attribute.
- These newly created points are then transferred (snapped) to the FA base layer linework which is coincident with SWRF and segmented every .1-mile. The resulting points are then located by the linear referencing tool Locate Features Along Route. This tool uses GNIS_ID and the mile marker measure to describe that point's location. These values are recorded in the FA base layer attribute table.
- The Make Route Event Tool uses this newly created table to construct new linework for the E&R attributes that is coincident with SWRF. The GIS software can easily interpret the extents of this

coincident linework in relation to the SWRF layer. This relationship is then recorded in the FA base layer attribute table as "Yes" for being present in that .1-mile segment.

3.2 Intersection of Environmental and Recreational Attributes (Polygons) and FA Base Layer

Polygon attribute extents are used in cases where original attribute data were indicated by HUC basins or other polygons. Processing of polygon attribute data is much simpler than processing polylines. Basically, if FA base layer linework intersects the polygon, the attribute table is populated for the intersecting line segments. In Figure 15, the blue line is populated with a "Yes" as having that E&R attribute present, and purple line does not correspond to that E&R attribute.

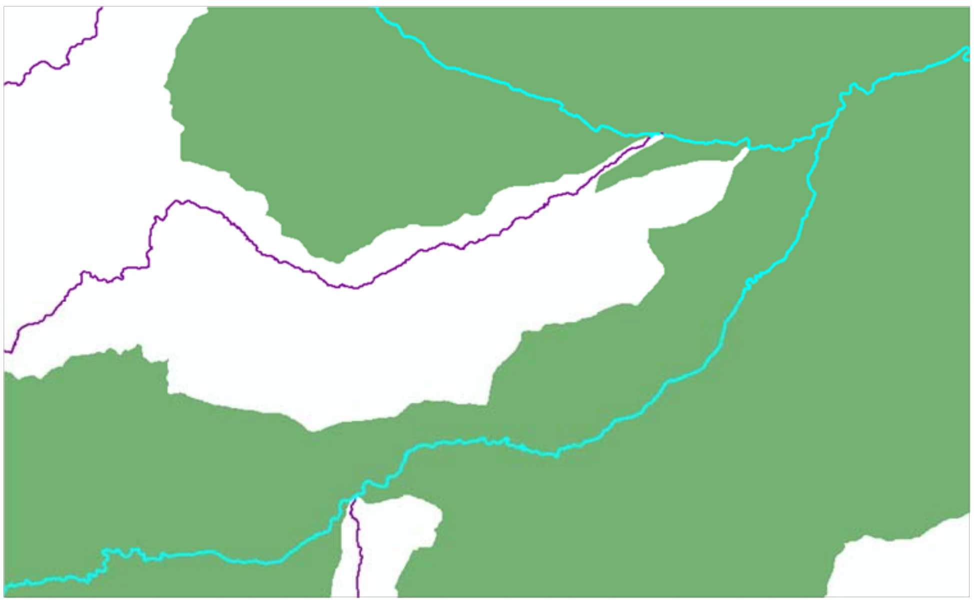


Figure 15. The Brassy Minnow Habitat is the green polygon. The GIS software differentiates reaches within (blue), and those outside of the Habitat (purple).

4-Intersection of Instream Flow, and Projects and Studies Layers with Final BIP Phase II FAs

Both the instream flow (ISF), and the projects and studies (P&S) layers have polyline geometry. The same polyline approach used for the E&R attributes was used to intersect these two layers with the FA base layer. Details of that workflow are not discussed in the subsections below, as they are described in section 3.1. However, a quick summary is start/end points are created for each feature, they are snapped to the SWRF linework, located along that linework, and used to define the extents of their existence by populating the FA base layer table with a "Yes" in the appropriate column.

The FA base layer already has the extents of the E&R attributes written in its attribute table, and with the intersection detailed in this section, a comprehensive resource is created for the essential E&R data for FAs in the South Platte Basin.

4.1-Intersection of ISFs and FA Base Layer

The current ISF layer was downloaded from the Colorado's Decision Support Systems (CDSS) website (see appendix for URL). It was updated January of 2015 and is mostly coincident with SWRF linework because the ISF reaches have been created by linearly referencing NHD, which is also the source for the SWRF layer. If the two layers were 100% coincident, the linear referencing tool could determine the stream mile measures directly. However, there was some deviation in the linework and the workflow for the E&R attributes was executed on the ISF layer. Additionally, multiple ISFs are decreed or pending for the same stream segment in some cases. This creates overlaps in the linework (a maximum of 10 overlaps exist in the ISF layer, see Figure 16), which complicates displaying this additional data within the already large FA base layer attribute table. In an attempt to keep this table a manageable size, a second reference table was created to store the multiple ISF IDs present on any given .1-mile segment. Subsequently, a user of the data would check the FA table to verify that there is a "Yes" in the ISF column of that stream segment, then use that GNIS_ID and .1-mile marker to look up the particular ISF ID in the reference table. The TSTool software was used to process these tables into a final Excel workbook product (see BIP memorandum "Stream Mile Representation Framework TSTool Workflow Processing", March 2015.

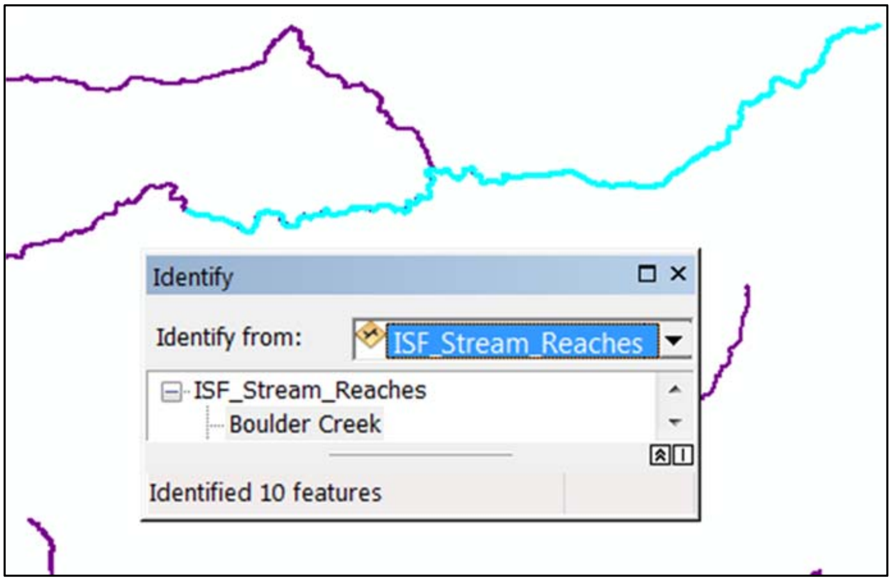


Figure 16. When investigating ISFs on Boulder Creek, 10 overlapping features are present on the single visible blue line. Although every reach does not have this characteristic, the workflow accommodates by retaining all pertinent data for a given reach. This is a characteristic of the Projects and Studies layer also, having a maximum of 40 overlaps.

- The FA base layer's ISF column was populated as described in section 3.1 for the E&R attributes. New ISF linework was also constructed similarly.
- To retain all of the ISF IDs from the overlapping situations, a second table was created to display this information for each .1-mile segment. A user of this data can cross reference the GNIS_ID and .1-mile marker in this second table which identifies each ISF ID present.
- Finally, a third table was created containing pertinent data relative to the ISF IDs, such as case number, type, and status. To use this table, cross reference the ISF ID with the same ID in the table for the relevant information. These second and third tables were created to limit the number of columns in the FA base layer attribute table.

4.2-Intersection of the Projects and Studies layer and FA Base Layer

The P&S layer was the same one used for Phase I BIP. It is the largest layer intersected with ~9700 line segments. As with the E&R attributes, the linework is not coincident with SWRF and the same workflow was followed detailed in section 3.1. Multiple projects and studies often occur on a common stream segment. This is represented in the layer with overlapping linework similar to the ISF layer (see Figure 16), and is also handled by creating two additional tables to keep the size of the FA base layer attribute table manageable.

- As noted, this layer was processed similar to the E&R attribute layers, but, due to its size, time did not allow for manual QC. Therefore, tables were created containing the P&Ss that did not transfer to the SWRF linework, and not incorporated into the FA base layer (see Appendix C, Manual QC of Section 4.1 Workflow).
- P&Ss that are newer than this P&S layer were not processed. The locational information provided for these new P&Ss was varied and mostly not specific. Additional time is needed to interpret these locations, incorporate into a GIS format, and then input into these processes for inclusion in SMRF.

5-Linear Referencing Gages and Diversions to be Incorporated into the Stream Mile Representation Framework

Point data is relatively simple for GIS linear referencing tools to handle. Both gages and diversions layers have this point geometry. The linear referencing performed for these layers is similar to the prior workflows for start/end points. It locates the points and writes the measure of that feature along each GNIS to a new table. With this newly derived information, the data are in the standard format required to be incorporated into the SMRF. One difference between this workflow and the previous linear references, is that these points are not snapped to the SWRF. The GIS software can still locate them and writes an additional column which is populated with the distance each respective point is away from the SWRF linework.

5.1-The Gage Layer

- The gage layer was downloaded from the CDSS website on February 4, 2015. Both historic and real-time layers were processed (see Appendix A for URL).
- To begin this workflow, point features outside of the South Platte Basin were filtered out of these layers. The remaining point features were only those within the South Platte Basin and comprised the gage layer that was run through this workflow. The workflow populated the column for measures of the gages and allowed for inclusion to SMRF.
- An additional layer was created containing only the 4 gages that were used to define the focal points of the 4 Example Areas for BIP Phase II.

5.2-The Diversion Layer

- The diversions layer was downloaded from the CDSS website on May 4, 2014 by (see Appendix A for more detail).
- West Sage Water Consultants filtered this layer and created 4 tables identifying the diversions of interest in near proximity to the Example Area Gages defined in section 5.1.
- These 4 sublayers of the diversion layer were run through the linear referencing workflow. This populated the column for measures of the diversions and allowed for inclusion to SMRF.

Appendix A-Data Sources and Directory

Overall database structure – This appendix details the structure of the database and sources of input data that are not defined in the workflows in Appendix C.

Location of database: *Dropbox/NBIP Team/Phase II/Data-Spatial/*

- *BIPphaseII_SMRF.gdb*-Workspace containing inputs and outputs of workflows. Also contains all of the geodatabase tables output by the workflows. This is the default workspace for all BIP Phase II GIS work, unless otherwise noted.
    - *METRO_SP_ATTRIBUTES* - Feature dataset containing mostly input layers. Original sources of these input layers are:
        - All layers beginning with “**ATTRIBUTE**”, all layers beginning with “**MetroSplatteBasin**” (except the two “**Projects**” layers), **SouthPlatte_Subbasins**, and **metro_RT_bound_Dissolve**: *Dropbox/NBIP Team/Mapping/Attributes Data/SWSI_NCNA_PH1_BASIN_DATA.gdb/METRO_SOUTHPLATTE*
            - **MetroSplatteBasin_Counties**…deleted slivers from Chaffee, Lake, Summit,

Grand, and Jackson Counties…all on West side of basin…most likely remnants from a clip performed before BIP Phase II.

- **div1_diversions:** West Sage Water Consultants acquired via email. The email was from Amec Foster Wheeler and stated it was downloaded "off the CDSS website on 5/2/2014."
- **FocusAreas2014V3**: Was imported from **2014FocusAreasV3.shp** located in this directory, *Dropbox/NBIP Team/Mapping/NEW GIS/2014FocusAreasV3 w numbers/*
- **BasinExtent_SP:** The South Platte Basin was selected from **DIV3CO.shp** and exported to the workspace. **DIV3CO.shp** is the download titled "Division Boundaries" from the CDSS GIS data website http://cdss.state.co.us/GIS/Pages/AllGISData.aspx.
- **GagesHistoric_SP, GagesRealtime_SP,** and **ISF_SP_2015**: Respectively downloaded "Surface Water Gages - Historic (with Period of Record)", "Surface Water Gages - Real Time (current conditions)", and "Instream Flow Reaches – Decreed and pending reaches" from the CDSS GIS data website http://cdss.state.co.us/GIS/Pages/AllGISData.aspx. These shapefiles were filtered to only include data within the South Platte Basin (used **BasinExtent_SP**), and exported to a feature class in this feature dataset.
- **MetroSplatteBasin_All_Projects** and **MetroSplatteBasin_All_Projects_Studies** (**MetroSplatteBasin_All_Projects** was not processed in BIP Phase II, as all its data already exist in **MetroSplatteBasin_All_Projects_Studies):** *Dropbox***/***NBIP Team/Mapping/SWSI/SWSI_GIS/SWSI 2010 and 2016 GIS/NCNA/Geodatabase/SWSI_NCNA_PH2_BASIN_DATA.gdb/METRO_SOUTHPLATTE*
- **NHDWaterbody**: Downloaded from USGS website http://nhd.usgs.gov/data.html in December 2014.

- *METRO_SP_ATTRIBUTES_onSWRF* – Feature dataset containing layers with geometry coincident with SWRF linework. Intermediate and finalized layers reside here, and some have the .1-mile segmented geometry. The following layers were acquired as indicated and the remainder of layers in this feature dataset are outputs of processing detailed in Appendix C:
  - **Strm_Route** and **Strm_Mile_Con_Pnts**: DWR provided via email on November 13, 2014. **Strm_Route** is an early version of **SWRF** and **Strm_Mile_Con_Pnts** is a point layer of confluences.
  - **SWRF_SP**: This FC was filtered to only include data within the South Platte Basin (used **BasinExtent_SP**). Its source is the CDSS GIS data website http://cdss.state.co.us/GIS/Pages/AllGISData.aspx. The link for the download is titled "Source Water Route Framework" and was downloaded February 2015.
- *METRO_SP_ATTRIBUTES_OUTPUTS* – Feature dataset mostly containing intermediate outputs used in creating finalized layers. Details of a layer's construction are in Appendix C if not detailed here:
  - **Strm_Route_Buffer**: Layer is a 1000' buffer of **Strm_Route** used by the WriteGNIS_ID MB Tool.
- Geodatabase Tables – Most of the tables in the geodatabase are defined in their respective workflows from Appendix C. Here are sources of the additional tables.
  - **Diversions_Balzac_ex_area**, **Diversions_Chatfield_ex_area**, **Diversions_Elevenmile_ex_area**, and **Diversions_St_Vrain_ex_area**: West Sage Water Consultants filtered **div1_diversions** and created 4 tables identifying the diversions of interest in near proximity to the Example Area Gages defined in section 5.1. These are the tables after being imported to the workspace from their native format of .xlsx.

Appendix B-Description of Model Builder (MB) Tools

- WriteGNIS_ID – This tool is for polyline features and uses a 1000' buffer of SWRF GNIS_ID's (**Strm_Route_Buffer**). As it iterates through each buffer in the layer, it checks to see if a polyline from the input layer is "completely within" the buffer. If there is, the tool writes that buffer's GNIS_ID to the attribute table of the input layer's identified feature. This tool has its shortcomings. In the case where a line segment or COMID (shown as the yellow line in figure 17) is relatively short, multiple GNIS_ID buffers can be coincident and the incorrect ID can be written. In the case of figure 17, the COMID was assigned 00204956 instead of 00177820. Also, it cannot account for linework that deviates more than 1000' from SWRF. QC is generally needed for the larger layers this tool is executed on because some reaches need to be split due to one line segment traversing two or more separate GNIS_IDs, and some reaches of input linework are not even included in SWRF.

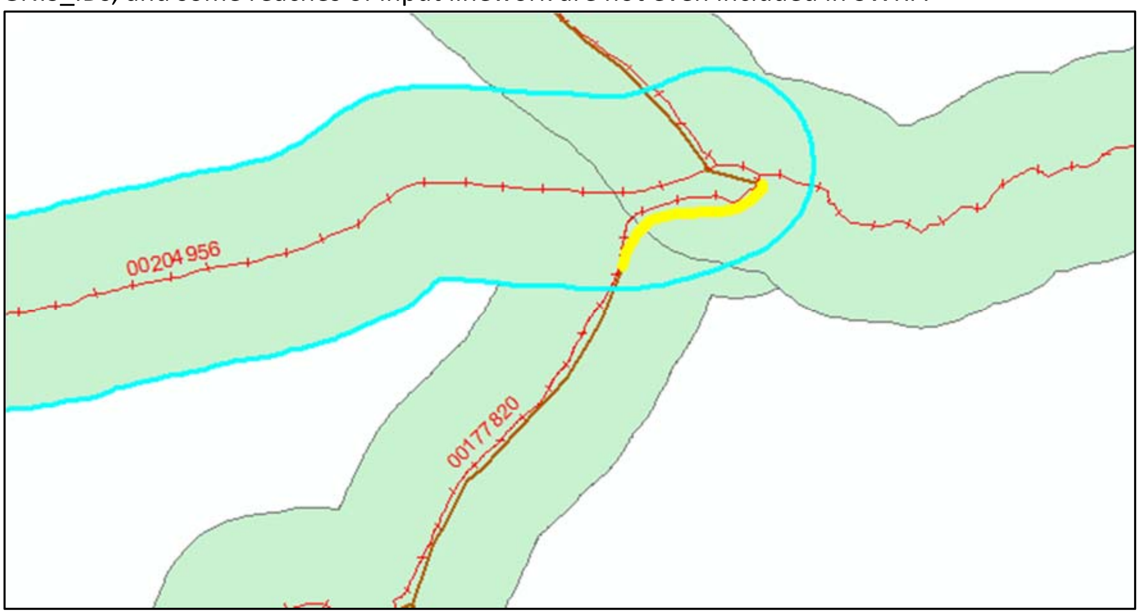


figure 17

- DefineExtentsFromTo – This tool is for polyline features whose geometry is singlepart. It utilizes the Add Geometry Attributes Tool to write xy-coordinates of all the features' start and end locations. Next, two Event Layers are created with the xy-data: one has start points and one has end points. Finally, it deletes the xy-fields from the FCs.
- SnapEvents (Advanced License Only) – This tool has a two tiered snapping process. The first snaps any start/end points within 85 meters of **Strm_Mile_Con_Pnts** (**Strm_Route** confluence points), to **Strm_Mile_Con_Pnts**. Second, any unsnapped point within 150 meters of **Strm_Route**, is snapped to **Strm_Route**.
- FMEASLocateEvents (start points) and TMEASLocateEvents (end points) – This tool locates events (start/end points) along reaches and writes the GNIS_ID they were located on, and the corresponding .1-mile marker distance along the stream to a new event table. Additionally, it deletes records (start/end points) in that table that were located on a GNIS_ID that it did not natively belong to.
- JoinStartEndMakeRoute - This tool joins two input events tables based on the field Line_ID, and creates linework coincident with SWRF in between the start and end point pairs. This tool only creates

linework coincident to Strm_Route_FA, not the entire Strm_Route. This was done to limit time spent QC-ing by only processing FA locales.

- FAoverlayLines – This tool takes the E&R attribute layers with SWRF linework (**filename_onSWRF**), and creates a new field with a heading describing its correlating E&R attribute. Next, it Selects by Location all features from **FocusAreas_onSWRF_TenthMiles** that Share a Line Segment With the E&R attribute input layer. With that selection, the Calculate Field writes a value of "Yes" to its respectively named field.
- FAoverlayPolys – This tool starts by running the Dissolve Tool on the original E&R attribute layers. This tool dissolves the boundaries between adjacent polygons. This eliminates extra start/end points from being created and will simplify creating linework for the polygon ranges. This tool also creates a new field with a heading describing its correlating E&R attribute. Next, it Selects by Location all features from **FocusAreas_onSWRF_TenthMiles** that Intersect the E&R attribute input layer. With that selection, the Calculate Field writes a value of "Yes" to its respectively named field.

Appendix C-Technical Details of GIS Workflows

MB Tools are only referenced in this section, but details of their processes are outlined in Appendix B. The naming convention **filename_GISprocess** is used in this appendix where **filename** is the actual name of the individual layer, and **GISprocess** is the descriptive text indicating the specific step in the workflow the layer represents. The introductory section numbers (e.g., 1.1) correspond to the sections in the body of this document.

ArcGIS information: All workflows were performed with the ArcGIS Basic License unless otherwise specified, 10.2.2 was the version, all settings were default unless otherwise specified.

FC-Feature Class

MB-Model Builder

1.1-Workflow for the Creation of the .1-Mile Markers Layer

1. Created a new spreadsheet **TenthMiles.xls** (figure 1) with .1-mile (160.9344 meters) increments starting in row 1, and continuing through 3520 (arbitrary number that is longer than any reach in SWRF). Meters were used because the native coordinate system of the data is also in meters.
2. Loaded **TenthMiles.xls** into workspace and kept name **TenthMiles**. Used Make Query Table Tool to populate each GNIS_ID with these .1-mile measures for the entire length of each reach. Input tables were **Strm_Route** and **TenthMiles.** Check mark fields TenthMiles.OBJECTID, TenthMiles.TenthMiles, Strm_Route.GNIS_ID, and Strm_Route.GNIS_Name. Select ADD_VIRTUAL_KEY_FIELD from Key Field Options, and named table **QueryTableTenths**. This table is temporary and is the input for the Table to Table Tool to create a permanent copy of the same name.
3. Ran tool Make Route Event Layer with Input Route Features as **Strm_Route**, and selected GNIS_ID as the RID. Input Event Table is **QueryTableTenths**, and its RID is Strm_Route_GNIS_ID. The Measure Field is TenthMiles_TenthMiles. This creates an Event Layer that will be used as input for segmenting **Strm_Route** into .1-mile segments, and act as .1-Mile Markers for the framework. The Event Layer is temporary and named **TenthMileMarkers**. This layer is the input for FC to FC Tool to create a permanent copy of the same name.
4. **TenthMileMarkers** has ~3.4 million features and this step created a sublayer to speed up processing. Summarized the field GNIS_ID in **FocusAreas** to create the table **GNIS_IDs_inFA.** In **TenthMileMarkers**

Selected by Attributes from the field GNIS_ID using this expression: GNIS_ID in (select GNIS_ID from **GNIS_IDs_inFA**). With this selection, ran FC to FC Tool to create the subset of **TenthMileMarkers** which was called **TenthMileMarkers_FA** (~23,000 features).

5. Ran Add Field Tool for **TenthMileMarkers_FA** and named it MileMarker. Ran Calculate Field Tool on field MileMarker using the expression: [TenthMiles_TenthMiles]*.000621371192237334. This is the equation to convert meters to miles. Additionally, in **TenthMileMarkers_FA** FC, Add Fields GNIS_ID and GNIS_Name. Populated these fields with the values from Strm_Route_GNIS_ID and Strm_Route_GNIS_Name respectively. Finally, Deleted Fields TenthMiles_TenthMiles, TenthMiles_OBJECTID, Strm_Route_GNIS_ID, and Strm_Route_GNIS_Name.

1.2- Workflow for the Creation of the .1-Mile Segmented SWRF Layer

1. Ran Split Line at Points Tool (Advanced License only). Input Features were **Strm_Route_FA**, and Point Features were **TenthMileMarkers**. Must use a small search radius: 1 meter or so...even though points were "created on the line," this tool will not find all of them with a 0 radius. Output FC was **Strm_Route_FA_Split**.
2. In **Strm_Route_FA_Split**, created two fields and titled FMEAS and TMEAS. With the Field Calculator and using Python, FMEAS was populated with the expression "round (!Shape!.firstPoint.M * .000621371192237334, 1)" and TMEAS was populated with the same expression, except changed the word "first" to "last" in the expression.

2-Workflow for the Construction of the Focus Area Base Layer (Sections 2.1-2.3)

1. **2014FocusAreasV3.shp** was imported as **FocusAreas2014V3** into the workspace. A copy of this FC was made and renamed to **FocusAreas** and moved to the *METRO_SP_ATTRIBUTES_OUTPUTS* feature dataset in the default workspace**.** In the **FocusAreas** FC, the Delete Field Tool was used to delete the 37 "categories" fields and the data within them.
2. **FocusAreas** FC was an input to the WriteGNIS_ID MB Tool. This tool writes the appropriate value to the GNIS_ID field. Once executed, empty GNIS_ID values were investigated (see Manual QC for step 2 below).
3. In **FocusAreas** FC, created and populated a static, unique Line_ID field that will be used to associate respective start and end point FCs after these points have been snapped to SWRF. The field was populated with the values from OBJECTID (OBJECTID is a dynamic, indexing field, where its values can change unnoticed and automatically by the software).
4. Ran DefineExtentsFromTo MB Tool on **FocusAreas** FC. This tool creates two FCs: one for start points, and one for end points of every feature in the input layer. Output FCs: **FocusAreas_EndPts** and **FocusAreas_StartPts**. These layers were duplicated and **_Presnap** was appended to their file names. These presnap layers preserve the native location of start and end points, as these points are relocated in the next step.
5. Ran SnapEvents MB Tool (Advanced License only) on **FocusAreas_StartPts** and **FocusAreas_EndPts** FCs. This tool only snaps points that are within 150 meters. Then, investigated points that did not snap, or snapped to the wrong GNIS_ID (see Manual QC for step 5 below).
6. Ran FMEASLocateEvents (on **FocusAreas_StartPts**) and TMEASLocateEvents (on **FocusAreas_EndPts**). These MB Tools locate events (start/end points) along reaches, and writes the distance measurement and GNIS_ID the point was located on to a new table. It also deletes records (start/end points) that were located on a GNIS_ID that the record did not natively belong to. The output tables were named **FocusAreas_StartPts_Events_Table** and **FocusAreas_EndPts_Events_Table**.

7. Ran JoinStartEndMakeRoute MB Tool with **FocusAreas_StartPts_Events_Table** and **FocusAreas_EndPts_Events_Table** as inputs. This tool joined the two input events tables based on the field Line_ID, and created linework coincident with SWRF in between the start and end point pairs. This linework is stored in the output FC **FocusAreas_onSWRF.** This completes the migration of phase I FA attribute table data to linework coincident with SWRF.
8. Ran FC to FC Tool on **FocusAreas_onSWRF** and output **FocusAreas_onSWRF_Done** to preserve an original layer. In the Field Map, fields FMEAS, TMEAS, COMID, GNIS_Name, and Line_ID were deleted. Also, the field Rationale had its length increased to 500 characters, and the contents of field Rationale2 were appended to Rationale using the Merge Rule of Join. Finally, field Rationale2 was deleted.
9. A new layer needs to be constructed that extracts the linework from the **Strm_Route** FC that is outside of the FAs. Summarized GNIS_IDs in **FocusAreas** which created a table with this information called **GNIS_IDs_inFA**. Then Selected by Attributes from **Strm_Route** those GNIS_IDs in FAs with the expression "GNIS_ID in (select GNIS_ID from **GNIS_IDs_inFA**)". With this selection, ran FC to FC Tool making **Strm_Route_FA**. The linework from a few extra GNIS_IDs were included due to incorrect GNIS_IDs from the input **FocusAreas**. See 00171011 in **FocusAreas**...it should be South Platte's GNIS_ID, 00201759. These extra IDs only add a small amount of linework, and were preserved in the layer. Also, non-FA segments in between FAs, AND on the same GNIS_ID were also retained to allow analysis on the borders of FAs. **Strm_Route_FA** is also split in .1-mile segments. See 1.2 for workflow.
10. Ran Spatial Join Tool. Target: **Strm_Route_FA_Split**. Join Features: **FocusAreas_onSWRF**. Output FC: **FocusAreas_onSWRF_TenthMiles_BaseLayer**. Match Option: SHARE_A_LINE_SEGMENT_WITH. In the Field Map: Delete Fields Shape_Length , FMEAS_1, COMID, GNIS_ID_1, GNIS_Name_1, Line_ID, TMEAS_1, and Shape_Length_1. This finalizes the FA layer which contains FA table data, SWRF linework, and a .1-mile segmented framework.
11. Duplicated **FocusAreas_onSWRF_TenthMiles_BaseLayer** and renamed **FocusAreas_onSWRF_TenthMiles**. This retains a "base layer" for future use or reference, while creating a layer that will be used to append the new, descriptive E&R attribute fields to, and populate with their extents.

<u>Manual QC of Section 2 Workflow (FA Base Layer)</u>

- **Step 2** – Some GNISs were not completely within the GNIS buffer. The following GNISs were not written correctly with the automated tool. Line IDs 58, 62, 334, 347, 510, 519, 520, 531, 536, 663, 983, 1149, 1152, 1153, 1254-1256, 1330, 1374, 1501, 1513.
- **Step 5 --** Selected by Location points within 4 meters, then switched selection to investigate why points weren't snapped to Strm_Route, or were snapped to the incorrect GNIS_ID. The following had to be manually snapped to SWRF. These Line_IDs were from Start Pts 2-4, 27, 31-33, 76, 220, 226, 252, 330, 336, 347, 383, 415, 431, 432, 595, 663, 713, 750-754, 767, 768, 770, 771, 773, 777, 786, 793-796, 801, 818-823, 825, 826, 845, 859, 863, 894, 895, 983, 1068, 1097, 1119-1122, 1124, 1135, 1136, 1147, 1207, 1208, 1210-1212, 1214-1217, 1218, 1221-1223, 1225-1227, 1251, 1252, 1254-1256, 1267, 1268, 1507. These Line_IDs were from End Pts 2, 3, 25, 27, 28, 30, 31, 33, 220, 221, 251, 288, 322, 329, 336, 337, 339, 368, 381, 404, 430, 431, 534, 593, 594, 714, 750-754, 768-771, 773, 774, 779, 787, 794-797, 802, 819, 821-826, 858, 864, 894, 900, 901, 1104, 1069, 01119-1125, 1134, 1136, 1138, 1143, 1207, 1210, 1213, 1215-1217, 1219, 1221-1224, 1226-1228, 1251, 1254-1256, 1257, 1266, 1267, 1514.

3.1-Workflow for the Intersection of Polyline E&R Attributes and FA Base Layer

1. This workflow was performed on the polyline E&R attribute layers beginning with the all caps word

"ATTRIBUTE" and are contained in the workspace's feature dataset *METRO_SP_ATTRIBUTES*.

- **ATTRIBUTE4_MetroSplatteBasin_PendingStreams_2010**, **ATTRIBUTE4_isfstreams2005_SP**, and **ATTRIBUTE4_isfstreams_2010** were NOT intersected because their data were represented in the current ISF layer that was downloaded from CDSS's GIS page (see Appendix A for URL).

2. Ran Unsplit Tool (Advanced License only) on each E&R attribute. This converts the multipart geometry to singlepart and the outputs were respectively named **filename_Unsplit**.
3. Ran WriteGNIS_ID MB Tool on **filename_Unsplit** to populate GNIS_ID field (some E&R attributes needed a GNIS_ID field to be created). This tool writes the appropriate value to the GNIS_ID field. Once executed, empty GNIS_ID values were investigated and populated manually (see Manual QC for step 3 below).
4. In **filename_Unsplit** FC, created and populated a static, unique Line_ID field that will be used to associate respective start and end point FCs after these points have been snapped to SWRF. The field was populated with the unique values from OBJECTID (OBJECTID is a dynamic, indexing field, where its values can change automatically by the software).
5. Ran DefineExtentsFromTo MB Tool on **filename_Unsplit** FC. This tool creates two FCs: one for start points, and one for end points of every feature in the input layer. Output FCs: **filename_EndPts** and **filename_StartPts**. These layers were duplicated and **_Presnap** was appended to their file names. These presnap layers preserve the native location of start and end points, as these points are relocated (snapped) in the next step.
6. Ran SnapEvents MB Tool (Advanced License only) on **filename_StartPts** and **filename_EndPts** FCs. This tool only snaps points that are within 150 meters of **Strm_Route** (see Manual QC for step 6 below).
7. Ran the MB Tools FMEASLocateEvents (on **filename_StartPts**) and TMEASLocateEvents (on **filename_EndPts**). These tools locate events (start/end points) along reaches, and writes the distance measurement, and GNIS_ID that the point was located on, to new tables. The output tables were named **filename_StartPts_Events_Table** and **filename_EndPts_Events_Table**. If these tables had a differing number of records, not all complete pairs of start and end points were located, and manual investigation was needed (see Manual QC for step 7 below).
8. Ran JoinStartEndMakeRoute MB Tool with **filename_StartPts_Events_Table** and **filename_EndPts_Events_Table** as inputs. This tool joined the two input events tables based on the field Line_ID, and created linework coincident with SWRF in between the start and end point pairs. This linework is stored in the output FC **filename_onSWRF.** This completes the migration of original E&R attribute linework, to linework coincident with SWRF.
9. The **RICDs** layer only has 5 short lines that are perpendicular to SWRF linework. This layer was handled differently than the other polylines. Selected by Location from **FocusAreas_onSWRF_TenthMiles** all features that were within 20 meters of **RICDs**' features. With this selection, Calculated Field on RICDs "Yes".
10. Finally, FAoverlayLines MB Tool was executed on **filename_onSWRF**. This tool creates the field with a descriptive heading indicating its respective E&R attribute, and Selects by Location features in **FocusAreas_onSWRF_TenthMiles** that Share a Line Segment With **filename_onSWRF**. With this selection, Calculated Field (on the newly created attribute field) with "Yes". By repeating this process with all the E&R attribute polyline layers, the **FocusAreas_onSWRF_TenthMiles'** table is appended to, and populated with these attribute's ranges.

<u>Manual QC of Section 3.1 Workflow (Polyline E&R attributes)</u>

- **Step 3 – ATTRIBUTE4_additional_wilderness_area_waters** (OBJECTID 39 was split…linework spanned two GNIS_IDs). **ATTRIBUTE4_CO_outstanding_and_wilderness_area_waters** (OBJECTIDs 268, 450, and 398 were split…linework spanned two GNIS_IDs).

- **Step 6 --** The following are PreLine_IDs that needed to have their linework split, as their linework spanned two different GNIS_IDs: **ATTRIBUTE4_CO_Outstanding_Waters_SP** (217, 360, 665, 689, 707, 763, 769).
- **Step 7 --** Some of the linework represented lakes in the original E&R attribute polyline layers. This scenario is not applicable to linear referencing and were filtered out of these processes. The following are Line_IDs of start/end points that were snapped to the incorrect GNIS_ID, or they were too far from the SWRF linework: **ATTRIBUTE4_CO_Outstanding_Waters_SP** (StartPts 31, 105, 316, 349, 645, 703, 708, 723, 759 & EndPts 92, 93, 106, 219, 239, 372, 567, 645, 663, 694, 759).

3.2-Workflow for the Intersection of Polygon E&R Attributes and FA Base Layer

1. FAoverlayPolys MB Tool processes the E&R attribute polygon layers to be represented in their respective fields in FC **FocusAreas_onSWRF_TenthMiles** with a value of "Yes" if they exist on that .1-mile segment. See FAoverlayPolys MB Tool for details.

4.1-Workflow for the Intersection of ISFs and FA Base Layer

1. Selected from **ISF_Stream_Reaches.shp** all features that Intersect the South Platte Basin. With this selection, ran FC to FC Tool and named the output **ISF_SP_2015** and saved to the default workspace.
2. Selected by Location from **ISF_SP_2015** that Share a Line Segment with **SWRF_FA_Split**. This filters out ISFs outside of FAs. With this selection, ran FC to FC Tool to create **ISF_SPFA_2015**.
3. Ran WriteGNIS_ID MB Tool on **ISF_SPFA_2015**. Investigated records that had no GNIS_ID value and manually typed in the correct GNIS_ID.
4. In **ISF_SPFA_2015** FC, created and populated a static, unique Line_ID field that will be used to associate respective start and end point FCs after these points have been snapped to SWRF. The field was populated with the unique values from OBJECTID (OBJECTID is a dynamic, indexing field, where its values can change automatically by the software).
5. The features in **ISF_SPFA_2015** were not singlepart geometry, but were made up of numerous parts per feature. This characteristic would create start/end points based on these parts, instead of the whole feature itself. To dissolve these multiple parts into one, the Dissolve Tool was executed on **ISF_SPFA_2015**. The output FC was named **ISF_SPFA_2015Dissolve**.
6. Ran DefineExtentsFromTo MB Tool on **ISF_SPFA_2015Dissolve** which created the two FCs **ISF_SPFA_2015Dissolve_StartPts** and **ISF_SPFA_2015Dissolve_Endpts.** Most of the linework from this current ISF layer was coincident with SWRF and the snap automation was not needed (see Manual QC for step 6 below).
7. Ran FMEASLocateEvents and TMEASLocateEvents MB Tools on **ISF_SPFA_2015Dissolve_StartPts** and **ISF_SPFA_2015Dissolve_EndPts** respectively. Output tables were named **ISF_SPFA_2015Dissolve_StartPts_Events_Table** and **ISF_SPFA_2015Dissolve_EndPts_Events_Table**.
8. Used the events tables created in Step 7 as input to the JoinStartEndMakeRoute MB Tool and named the output **ISF_SPFA_2015onSWRF**.
9. Ran the FAoverlayLines MB Tool on **ISF_SPFA_2015onSWRF**.
10. To account for overlapping features, a spatial join was executed to record all ISF IDs that were present for each .1-mile segment. Step 9 merely confirmed with a "Yes" the existence or not, of at least one ISF ID.

- Ran Spatial Join Tool. Target: **FocusAreas_onSWRF_TenthMiles_BaseLayer**. Join Features: **ISF_SPFA_2015onSWRF**. Output FC: **FocusAreas_onSWRF_TenthMiles_ISFdataJoin**. Match Option: SHARE_A_LINE_SEGMENT_WITH. In the Field Map: Delete Fields FMEAS_1, GNIS_ID_1, Line_ID, TMEAS_1, ISF_Type, Case_Number, Status, and Shape_Length_1. For field ID: set length to 500, Merge Rule of Join, Delimiter of "," (i.e., a comma).
- Duplicated **FocusAreas_onSWRF_TenthMiles_ISFdataJoin** and renamed **FocusAreas_onSWRF_TenthMiles_ISFdata**.
- In FC **FocusAreas_onSWRF_TenthMiles_ISFdata**, selected all records where JoinCount = 0 and deleted...no ISF is present on those line segments.
- Rename ID field to ISF_ID
- Add Field Basin and populate with "South Platte".

11. Finally, a third table was generated for users of the data to cross reference from the ISF input layer by using ISF_ID. The reference data included in this table are the fields ISF_Type, Case_Number, and Status.
    - Run Summary Statistics on **ISF_SP_2015.** Statistics Field is ID and Statistics Type is COUNT. Case Fields are ID, ISF_Type, Case_Number, and Status. Output table is **ISF_SP_2015IDreferenceTable**.

<u>**Manual QC of Section 4.1 Workflow (ISFs)**</u>

- **Step 6** – Line_IDs that were not already coincident with SWRF and were manually snapped: 50, 58, 69, 73, 79, 131, 174, 427.

4.2-Workflow for the Intersection of Projects and Studies, and FA Base Layer

1. The input layer **MetroSplatteBasin_All_Projects_Studies** was the largest intersecting layer and had linework that deviated greatly from SWRF.
2. Ran WriteGNIS_ID MB Tool on **MetroSplatteBasin_All_Projects_Studies**.
3. In **MetroSplatteBasin_All_Projects_Studies** FC, created and populated a static, unique Line_ID field that will be used to associate respective start and end point FCs after these points have been snapped to SWRF. The field was populated with the unique values from OBJECTID (OBJECTID is a dynamic, indexing field, where its values can change automatically by the software).
4. Ran DefineExtentsFromTo MB Tool on **MetroSplatteBasin_All_Projects_Studies** which created the two FCs **MetroSplatteBasin_All_Projects_Studies_StartPts** and **MetroSplatteBasin_All_Projects_Studies_Endpts.**
5. Ran SnapEvents MB Tool (Advanced License only) on the start/end point FCs created in previous step.
6. Ran FMEASLocateEvents and TMEASLocateEvents MB Tools on **MetroSplatteBasin_All_Projects_Studies_StartPts** and **MetroSplatteBasin_All_Projects_Studies_EndPts** respectively. Output tables were named **MetroSplatteBasin_All_Projects_Studies_StartPts_Events_Table** and **MetroSplatteBasin_All_Projects_Studies_EndPts_Events_Table**.
7. Used the events tables created in Step 6 as input to the JoinStartEndMakeRoute MB Tool and named the output **MetroSplatteBasin_AllProjStud_onSWRF**.
8. Ran the FAoverlayLines MB Tool on **MetroSplatteBasin_AllProjStud_onSWRF**.
9. To account for overlapping features, a spatial join was executed to record all Project IDs that were present for each .1-mile segment. Step 8 merely confirmed with a "Yes" the existence or not, of at

least one Project ID.

- Ran Spatial Join Tool. Target: **FocusAreas_onSWRF_TenthMiles_BaseLayer**. Join Features: **MetroSplatteBasin_AllProjStud_onSWRF**. Output FC: **FocusAreas_onSWRF_TenthMiles_AllProjStudDataJoin**. Match Option: SHARE_A_LINE_SEGMENT_WITH. In the Field Map: Delete Fields FMEAS_1, COMID, FDATE, RESOLUTION, Shape_Length, GNIS_ID_1, LENGHTKM, REACHCODE, FLOWDIR, WBARECOMI, FTYPE, FCODE, SO, SC, CUMDRAINAG, Length_Miles_Calc, Basin, InFocusArea, FirstOfOriginalContactID, FirstOfContactEmail, FirstOfContactOrganization, FirstOfContactOrganizationWebsite, Line_ID, TMEAS_1, Shape_Length_1, ProjectLocation, ProjectName, ProjectCategory, ProjectType, ProjectStatus, ProjectNote, and ProjectContact. For field ProjectID: set length to 500, Merge Rule of Join, Delimiter of "," (just type a comma).
- Duplicated **FocusAreas_onSWRF_TenthMiles_AllProjStudDataJoin** and renamed **FocusAreas_onSWRF_TenthMiles_AllProjStudData**.
- In FC **FocusAreas_onSWRF_TenthMiles_ AllProjStudData**, selected all records where JoinCount = 0 and deleted...no Project ID is present on those line segments.
- Add Field Basin and populate with "South Platte".

10. Finally, a third table was generated for users of the data to cross reference from the Projects and Studies input layer by using ProjectID. The reference data included in this table are the fields ProjectLocation, ProjectName, ProjectCategory, ProjectType, ProjectStatus, ProjectNote, ProjectID and ProjectContact.
    - Run Summary Statistics on **MetroSplatteBasin_All_Projects_Studies.** Statistics Field is ID and Statistics Type is COUNT. Case Fields are ProjectLocation, ProjectName, ProjectCategory, ProjectType, ProjectStatus, ProjectNote, ProjectID and ProjectContact. Output table is **MetroSplatteBasin_All_ProjStud_IDreferenceTable**.

Manual QC of Section 4.1 Workflow (P&S)

All Steps -- Minimal QC was performed due to its size (9702 features) and the large amount of time needed to investigate all situations not accommodated by the automated workflows. The automated processes described in this workflow captured 6953 of the 9702 features in **MetroSplatteBasin_All_Projects_Studies**. The table **ProjStudNOTonSWRF** was created by exporting all of the features in **MetroSplatteBasin_All_Projects_Studies**, that were not in **MetroSplatteBasin_AllProjStud_onSWRF**. This table is in the default workspace.

5.1-Workflow to Incorporate Gages into SMRF

1. This workflow was performed on both gages layers called **SurfaceWaterRealTime.shp** and **SurfaceWaterRealPOR.shp**. Ran the Clip Tool on both layers using the South Platte Basin's extent as the Clipping Feature. This results in two layers with only gages in the Basin and are named **GagesRealtime_SP** and **GagesHistoric_SP** respectively.
2. Ran Locate Features Along Routes Tool on **GagesRealtime_SP** and **GagesHistoric_SP**. These two FCs were the Input Features. Input Route Features: **Strm_Route_SP**. Route Identifier Field is GNIS_ID, Search Radius of 50 meters, Output Event Tables were named **GagesRealtime_SPevents** and **GagesHistoric_SPevents** respectively. Change Route Identifier Field from RID to GNIS_ID and uncheck box Keep only the closest route location.

3. Added two fields to each event table and titled them MEAS_ACT and MEAS_ACTtrun. Field Calculator on MEAS_ACT = [MEAS] * .000621371192237334. Field Calculator on MEAS_ACTtrun = int(!MEAS_ACT!*(10.0**1))/(10.0**1) (with Python selected).

Manual QC of Section 5.1 Workflow

All Steps – No QC of the outputs were performed.

5.2-Workflow to Incorporate Example Area Diversions into SMRF

1. This workflow was specific to the BIP Phase II Example Areas and used the following tables as inputs: **Diversions_Balzac_ex_area.xlsx**, **Diversions_Chatfield_ex_area.xlsx**, **Diversions_Elevenmile_ex_area.xlsx**, and **Diversions_St_Vrain_ex_area.xlsx**. They will be referred **DivTable** in this section, and all processes were executed on each of the tables.
2. The 4 **DivTables** were imported into the workspace after converting them to .dbf files.
3. Selected by Attributes from **div1_diversions** with the expression "HTMLLINK in (Select HTMLLINK from **DivTable**)" With this selection, ran Locate Features Along Route Tool to create an event table for each of the 4 Example Areas and **_Events** was appended to the respective output file name. The Input Features for this tool were **div1_diversions**, the Input Route Features were **SWRF_SP**, Route Identifier Field was GNIS_ID, Search Radius of 400 meters, and changed the second Route Identifier Field to GNIS_ID from RID (used search radius of 1000 meters for Elevenmile and St. Vrain Example Areas).
4. Added two fields to each event table and titled them MEAS_ACT and MEAS_ACTtrun. Field Calculator on MEAS_ACT = [MEAS] * .000621371192237334. Field Calculator on MEAS_ACTtrun = int(!MEAS_ACT!*(10.0**1))/(10.0**1) (with Python selected).
5. To create a FC with these identified diversions, Selected by Attributes (in Add to Selection mode) from **div1_diversions** with the expression "HTMLLINK in (Select HTMLLINK from **DivTable**)" This selected all diversions from the 4 tables. With this selection ran FC to FC Tool and named the output **ExampleAreasDiversions**.

Manual QC of Section 5.2 Workflow

All Steps – Some diversions got located twice and created duplicates in the **_Events** tables. These tables were small enough for this to be noticed easily and the duplicates were deleted.

Appendix D-Miscellaneous

- SWRF linework not in Strm_Route – Since most of the GIS processing was done with **Strm_Route**, a table was created indicating the features added to **Strm_Route** in creating **SWRF**. Selected by Location reaches in **SWRF_SP** that share a line segment with **Strm_Route**. After switching the selection, exported the table to the workspace and titled **SWRF_SPvsStrm_Route**. 17 features were different between the layers, but none of them are in the FAs. There are a few that have a confluence with FA reaches.
- Focus Areas not in SWRF -- Some FA reaches are not in **Strm_Route** or **SWRF** as they did not meet DWRs standards for inclusion. A layer was created to retain these features and its workflow was manual. Spatially and visually scanned for the reaches in **FocusAreas** that were not coincident with **Strm_Route**. Manually selected these reaches and ran FC to FC Tool. Named resulting FC **FAsNOT_inStrm_Route.**

Appendix D-3 - Stream Mile Representation Framework TSTool Workflow Processing

South Platte Basin Implementation Plan Memorandum

TO:	South Platte Basin and Metro Roundtables' Environmental and Recreational Subcommittee
REVIEWED BY:	West Sage Water Consultants
FROM:	Steve Malers (Open Water Foundation)
DATE:	March 31, 2015
RE:	Stream Mile Representation Framework TSTool Workflow Processing

Introduction

This memorandum provides an overview of using the TSTool software workflow processes to create the Stream Mile Framework (SMRF) Excel workbook, which is used to visualize and analyze environmental and recreational (E&R) data.

Approach

The SMRF implemented for the South Platte Basin Implementation Plan (BIP) Phase II project is illustrated in Figure 1. The SMRF represents streams as .1-mile segments, with overlapping environmental and recreational (E&R) attributes, projects and methods, and other data. This approach allows a large amount of data to be spatially represented in Excel to .1-mile resolution, which allows E&R stakeholders to visualize data local to a stream reach of interest, and perform analysis.

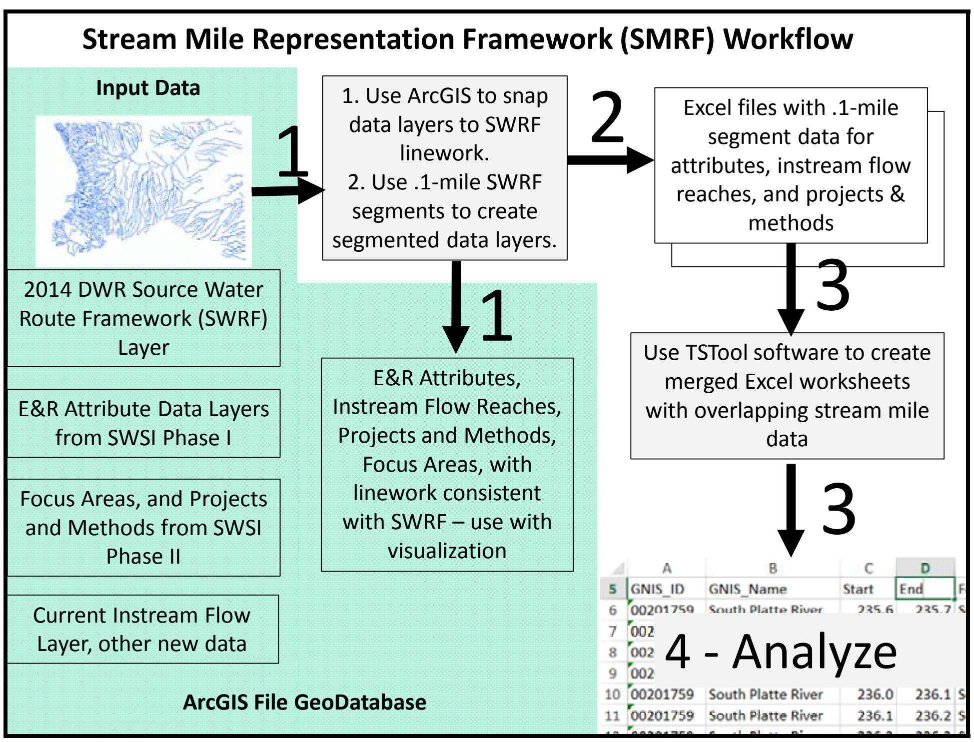


Figure 1. Stream Mile Representation Framework Workflow Overview

ArcGIS software is used to manage and process spatial data from multiple sources. Geographical Information System (GIS) processing is described in the BIP memo "Stream Mile Representation Framework GIS Workflow Processing," March, 2015. The results of GIS processing (output from step 2 in Figure 1) are several Excel files. Figures 2-9 are provided in Appendix A of this memorandum to illustrate the data.

- FAonSWRFandAttribute.xlsx – contains .1-mile stream segments that overlap focus areas (FA) and E&R attributes (forms the foundation of the SMRF data) – see Figure 2
- ISF_Data.xlsx – contains .1-mile stream segments that overlap instream flow reaches (is joined to the SMRF data, as described in this memorandum) – see Figure 3
- ISF_IDReference.xlsx – contains additional instream flow reach data corresponding to ISF_Data.xlsx (included in the SMRF Excel workbook as comments) – see Figure 4
- ProjStud_Data.xlsx – contains .1-mile stream segments with overlapping E&R projects and methods data (is joined to the SMRF data, as described in this memorandum) – see Figure 5
- ProjStud_IDreference.xlsx – contains additional projects and methods data corresponding to ProjStud_Data.xlsx (included in the SMRF Excel workbook as comments) – see Figure 6
- GagesHistoric_SP.xls – stream gages with historical data, indicated in corresponding stream segment – see Figure 7
- GagesRealtime_SP.xls – stream gages with real-time data, indicated in corresponding stream segment – see Figure 8
- Diversions_St_Vrain_ex_area_Events.xlx – key diversion structures for Saint Vrain – see Figure 9 (other BIP example areas have similar data)

The TSTool software, which was originally developed as part of Colorado's Decision Support Systems (CDSS) has been enhanced over time to include functionality to automate processing of time series and tabular data, as well reading/writing Excel files. The SMRF GIS data processing steps export E&R data from layer attribute tables into Excel files. TSTool is able to read these files and automate processing into the final SMRF workbook. Consequently, changes to input data can be reprocessed with minimal effort and changes to approach can be implemented as needed and data reprocessed. Significant enhancements to TSTool were implemented for the BIP project to automate processing of E&R data and create the final Excel workbook containing SMRF data.

The TSTool command file "SouthPlatte-Examples-StreamMileAnalysis.TSTool" (see Appendix B of this memorandum) is run to process the Excel files exported by the GIS process. This process is configured to process the data for the South Platte BIP but could be modified to process other data. The main steps in the command file are as follows:

1. Read the Excel files listed above into TSTool tables.
2. For each input data table, format a unique identifier for stream segments by concatenating the GNIS_ID (stream identifier) and starting stream mile. For example, a .1-mile segment of the South Platte is uniquely identified with "00201759_000.1". This text identifier simplifies sorting table rows and joining data from multiple tables.
3. Join additional data to the FA/attribute data:
    a. Join the FAonSWRFandAttributes table (which contains FAs and attributes) with the ISF_Data table (instream flow reaches) – instream flow case numbers in a .1-mile

segment can overlap and are indicated by a comma-separated list of case numbers in a table column "ISF_ID"

b. Join the FAonSWRFandAttributes table with the ProjStud_Data table (projects and methods) – projects and methods in a .1-mile segment can overlap and are indicated by a comma-separated list of case numbers in a table column "ProjectID"
c. Join the FAonSWRFandAttributes table with the GagesHistoric_SP table (stream gage locations)
d. Join the FAonSWRFandAttributes table with LowerSouthPlatte_Diversion_Table_Events, St_Vrain_Diversions_Events, SouthPlatteMountain_DiversionTable_Events, and MetroCorridor_Diversion_Table_Events tables (diversion structure locations). If more than one diversion structure exists in a .1-mile segment, multiple columns are added.

4. For each BIP example area:
    a. Copy the stream segments for the example area into a new table appropriate for the BIP example area (e.g., "MetroCorridor")
    b. Split the "ISF_ID" column containing comma-separated list of ISF identifiers into separate columns so that each ISF reach is unique to the column – column headings are set to ISF_1, ISF2, etc.
    c. Split the "ProjectID" column containing comma-separated list of project identifiers into separate columns so that each project/method is unique to the column. Column headings are set to PRJ_1, PRJ_2, etc.
5. For each BIP example area:
    a. Create the initial Excel worksheet and populate with the joined data from above
    b. For each ISF identifier (ISF_1, ISF_2, …):
        i. Set the column heading comment by formatting matching data from the ISF_IDreference table. A comment is used because otherwise the main SMRF Excel worksheet would become very wide.
    c. For each project/method identifier (PRJ_1, PRJ_2,…):
        i. Set the column heading comment by formatting matching data from the ProjStud_IDreference table. A comment is used because otherwise the main SMRF Excel worksheet would become very wide.
    d. Set the worksheet formatting to freeze panes for the leftmost columns and topmost rows, to help with navigation.
6. Close the Excel workbook

The resulting workbook contains all the SMRF data for the example areas, as shown in Figure 10. Each row corresponds to a .1-mile stream segment and each column corresponds to an attribute, instream flow right, project, or method, etc.

	A	B	C	D	E	F	G	H	I	J	L	O
1	GNIS_ID	GNIS_Name	GNIS_ID_FMEAS	FMEAS	TMEAS	Geographic	FocusArea	Type	Rationale	FocusAreaID	BaldEagle	BrassyMinnow
2	00178190	North Saint Vrain Creek	00178190_000.0	0.0	0.1	Northern	North Saint	Recreational	Whitewat	14	Yes	
3	00178190	North Saint Vrain Creek	00178190_000.1	0.1	0.2	Northern	North Saint	Recreational	Whitewat	14	Yes	
4	00178190	North Saint Vrain Creek	00178190_000.2	0.2	0.3	Northern	North Saint	Recreational	Whitewat	14	Yes	
5	00178190	North Saint Vrain Creek	00178190_000.3	0.3	0.4	Northern	North Saint	Recreational	Whitewat	14	Yes	
6	00178190	North Saint Vrain Creek	00178190_000.4	0.4	0.5	Northern	North Saint	Recreational	Whitewat	14	Yes	
7	00178190	North Saint Vrain Creek	00178190_000.5	0.5	0.6	Northern	North Saint	Recreational	Whitewat	14	Yes	
8	00178190	North Saint Vrain Creek	00178190_000.6	0.6	0.7	Northern	North Saint	Recreational	Whitewat	14	Yes	
9	00178190	North Saint Vrain Creek	00178190_000.7	0.7	0.8	Northern	North Saint	Recreational	Whitewat	14	Yes	
10	00178190	North Saint Vrain Creek	00178190_000.8	0.8	0.9	Northern	North Saint	Recreational	Whitewat	14	Yes	
11	00178190	North Saint Vrain Creek	00178190_000.9	0.9	1.0	Northern	North Saint	Recreational	Whitewat	14	Yes	
12	00178190	North Saint Vrain Creek	00178190_001.0	1.0	1.1	Northern	North Saint	Recreational	Whitewat	14	Yes	
13	00178190	North Saint Vrain Creek	00178190_001.1	1.1	1.2	Northern	North Saint	Recreational	Whitewat	14	Yes	
14	00178190	North Saint Vrain Creek	00178190_001.2	1.2	1.3	Northern	North Saint	Recreational	Whitewat	14	Yes	
15	00178190	North Saint Vrain Creek	00178190_001.3	1.3	1.4	Northern	North Saint	Recreational	Whitewat	14		

Figure 10. SMRF Excel Workbook with integrated data by .1-mile segments

Comments and Recommendations

TSTool was originally developed to process time series. However, enhancements over the past few years to add table processing and Excel integration has resulted in TSTool being able to automate processing of a large amount of tabular data. New TSTool software features were required to process the SMRF data, which are included in TSTool version 11.00.00, and additional enhancements may be needed in the future if the SMRF is implemented beyond the BIP Phase II example areas. The prototype TSTool command file can be enhanced to include other areas. It is recommended that the TSTool automation be utilized in conjunction with automated GIS processing to ensure that the SMRF approach can be updated and used efficiently to analyze E&R requirements and gaps. Additional integration can also occur if historical streamflow time series and modeling results are used to create metrics to evaluate E&R gap. Specific enhancement recommendations for the SMRF workflow processing include:

1. Legacy E&R data available for analysis provides limited project and method data. With additional resources, it would be possible to add links to published master plans or other documents that describe projects.
2. The SMRF workbook does not provide instream flow water right decreed flow values. Such information could be queried from the instream flow database or spatial data layer attributes. This would allow a basic review of flow requirements.
3. Limited integration with streamflow historical data has been implemented. Analysis of streamflow data against instream flow or other environmental flow requirements could be included as metrics on the SWRF Excel worksheets.
4. Land use and land ownership are not included as columns in the final Excel workbook, but could be added with additional resources. The legacy SWSI data included land ownership in projects and methods, for example as “Stewardship” projects.
5. Wetlands data for areas adjoining streams has not been included but could be added to provide an understanding of the extended ecosystem outside of stream channels.
6. Stakeholder-supplied data can be added to the SMRF Excel worksheets. However, an automated method to merge stakeholder-supplied data needs to be implemented. See the memo “Stream Mile Representation Framework Stakeholder Data Input,” March 2015.
7. If sufficient data and analysis are implemented, the cells in the SMRF worksheets can be color-coded to indicate gap. Because of the complexity of overlapping data, multiple evaluation metrics and associated color coding will likely be needed.
8. Additional investment in the TSTool software and data processing processes will be required to implement a full production version of the SMRF.

9. Basic web visualization of the SMRF using Google Maps has been prototyped to demonstrate the potential for linking the tabular data with spatial data. Additional investment in such visualization tools is needed to provide a user-friendly tool.

Appendix A – Figures Illustrating SMRF Data Inputs for Workflow Processing

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	GNIS_ID	GNIS_Name	FMEAS	TMEAS	Geographic	Segment	Type	Rationale	Segment_No	AddWilderness	BaldEagle	BirdArea	BorealToad	BrassyMinnow
2	00835484	Arikaree River	0	0.1	High Plains	Republican Drain	Environmental	Habitat for state listed	24					Yes
3	00835484	Arikaree River	0.1	0.2	High Plains	Republican Drain	Environmental	Habitat for state listed	24					Yes
4	00835484	Arikaree River	0.2	0.3	High Plains	Republican Drain	Environmental	Habitat for state listed	24					Yes
5	00835484	Arikaree River	0.3	0.4	High Plains	Republican Drain	Environmental	Habitat for state listed	24					Yes
6	00835484	Arikaree River	0.4	0.5	High Plains	Republican Drain	Environmental	Habitat for state listed	24					Yes
7	00835484	Arikaree River	0.5	0.6	High Plains	Republican Drain	Environmental	Habitat for state listed	24					Yes
8	00835484	Arikaree River	0.6	0.7	High Plains	Republican Drain	Environmental	Habitat for state listed	24					Yes
9	00835484	Arikaree River	0.7	0.8	High Plains	Republican Drain	Environmental	Habitat for state listed	24					Yes
10	00835484	Arikaree River	0.8	0.9	High Plains	Republican Drain	Environmental	Habitat for state listed	24					Yes
11	00835484	Arikaree River	0.9	1	High Plains	Republican Drain	Environmental	Habitat for state listed	24					Yes
12	00835484	Arikaree River	1	1.1	High Plains	Republican Drain	Environmental	Habitat for state listed	24					Yes
13	00835484	Arikaree River	1.1	1.2	High Plains	Republican Drain	Environmental	Habitat for state listed	24					Yes
14	00835484	Arikaree River	1.2	1.3	High Plains	Republican Drain	Environmental	Habitat for state listed	24					Yes
15	00835484	Arikaree River	1.3	1.4	High Plains	Republican Drain	Environmental	Habitat for state listed	24					Yes
16	00835484	Arikaree River	1.4	1.5	High Plains	Republican Drain	Environmental	Habitat for state listed	24					Yes
17	00835484	Arikaree River	1.5	1.6	High Plains	Republican Drain	Environmental	Habitat for state listed	24					Yes
18	00835484	Arikaree River	1.6	1.7	High Plains	Republican Drain	Environmental	Habitat for state listed	24					Yes
19	00835484	Arikaree River	1.7	1.8	High Plains	Republican Drain	Environmental	Habitat for state listed	24					Yes

Figure 2. FAonSWRFandAttributes.xls worksheet (note Segment_No = focus area number)

	A	B	C	D	E	F	G
1	GNIS_ID	GNIS_Name	FMEAS	TMEAS	Segment_No	ISF_ID	Basin
2	00060001	Como Creek	5.8	5.9	27	08/1/A-001	South Platte
3	00060001	Como Creek	3.5	3.6	27	08/1/A-001	South Platte
4	00060001	Como Creek	4	4.1	27	08/1/A-001	South Platte
5	00060001	Como Creek	5	5.1	27	08/1/A-001	South Platte
6	00060001	Como Creek	4.5	4.6	27	08/1/A-001	South Platte
7	00060001	Como Creek	5.5	5.6	27	08/1/A-001	South Platte
8	00060001	Como Creek	2.7	2.8	27	08/1/A-001	South Platte
9	00060001	Como Creek	6	6.1	27	08/1/A-001	South Platte
10	00060001	Como Creek	3.7	3.8	27	08/1/A-001	South Platte
11	00060001	Como Creek	3.2	3.3	27	08/1/A-001	South Platte
12	00060001	Como Creek	4.2	4.3	27	08/1/A-001	South Platte
13	00060001	Como Creek	4.7	4.8	27	08/1/A-001	South Platte
14	00060001	Como Creek	2.4	2.5	27	08/1/A-001	South Platte
15	00060001	Como Creek	5.7	5.8	27	08/1/A-001	South Platte

Figure 3. ISF_Data.xls worksheet containing data needed to link to SMRF (note Segment_No = focus area number)

	A	B	C	D
1	ID	ISF_Type	Case_Numbe	Status
2	02/1/A-003	Appropriated	1-02CW373	Decreed
3	02/1/ACQ-01	Acquired	02/1/ACQ-01	Decreed
4	02/1/ACQ-02A	Acquired	02/1/ACQ-02A	Decreed
5	02/1/ACQ-02B	Acquired	02/1/ACQ-02B	Decreed
6	02/1/ACQ-02C	Acquired	02/1/ACQ-02C	Decreed
7	02/1/ACQ-03A	Acquired	02/1/ACQ-03A	Decreed
8	02/1/ACQ-03B	Acquired	02/1/ACQ-03B	Decreed
9	02/1/ACQ-04A	Acquired	02/1/ACQ-04A	Decreed
10	02/1/ACQ-04B	Acquired	02/1/ACQ-04B	Decreed
11	02/1/ACQ-04C	Acquired	02/1/ACQ-04C	Decreed
12	02/1/ACQ-05A	Acquired	02/1/ACQ-05A	Decreed
13	02/1/ACQ-05B	Acquired	02/1/ACQ-05B	Decreed

Figure 4. ISF_IDreference.xls Worksheet containing additional instream flow read data

	A	B	C	D	E	F	G
1	GNIS_ID	GNIS_Name	FMEAS	TMEAS	Segment_No	ProjectID	Basin
2	00060001	Como Creek	1.2	1.3	27	08/1/A-001,169	South Platte
3	00060001	Como Creek	1.3	1.4	27	08/1/A-001,169	South Platte
4	00060001	Como Creek	1.4	1.5	27	08/1/A-001,169	South Platte
5	00060001	Como Creek	1.5	1.6	27	08/1/A-001,169	South Platte
6	00060001	Como Creek	1.6	1.7	27	08/1/A-001,169	South Platte
7	00060001	Como Creek	1.7	1.8	27	08/1/A-001,169	South Platte
8	00060001	Como Creek	1.8	1.9	27	08/1/A-001,169	South Platte
9	00060001	Como Creek	1.9	2	27	08/1/A-001,169	South Platte
10	00060001	Como Creek	2	2.1	27	08/1/A-001,169	South Platte
11	00060001	Como Creek	2.1	2.2	27	08/1/A-001,169	South Platte
12	00060001	Como Creek	2.2	2.3	27	08/1/A-001,169	South Platte
13	00060001	Como Creek	2.3	2.4	27	08/1/A-001,169	South Platte

Figure 5. ProjStud_Data.xlsx worksheet containing data to link to SMRF

	A	B	C	D	E	F	G	H
1	ProjectLocation	ProjectName	ProjectCategory	ProjectType	ProjectStatus	ProjectNote	ProjectID	ProjectContact
2		Black Hollow Creek	ISF	Appropriated	Completed		10/1/A-001	
3		Como Creek	ISF	Appropriated	Completed		08/1/A-001	
4		Stewardship Protection	Stewardship	Project	Completed	0.937424212887	Stewardship_21884	
5		Stewardship Protection	Stewardship	Project	Completed	0.970433275425	Stewardship_22579	
6		Stewardship Protection	Stewardship	Project	Completed	0.977059441229	Stewardship_22605	
7		Stewardship Protection	Stewardship	Project	Completed	0.979179700896	Stewardship_21933	
8		Stewardship Protection	Stewardship	Project	Completed	0.982728585182	Stewardship_22606	
9		Stewardship Protection	Stewardship	Project	Completed	0.984057682368	Stewardship_21935	
10		Stewardship Protection	Stewardship	Project	Completed	0.98996142916	Stewardship_22212	
11		Stewardship Protection	Stewardship	Project	Completed	0.990451048902	Stewardship_22589	
12		Stewardship Protection	Stewardship	Project	Completed	0.995413155346	Stewardship_25699	
13		Stewardship Protection	Stewardship	Project	Completed	0.995681606512	Stewardship_22138	
14		Stewardship Protection	Stewardship	Project	Completed	0.996978158621	Stewardship_21889	
15		Stewardship Protection	Stewardship	Project	Completed	0.99709643144	Stewardship_22598	

Figure 6. ProjStud_IDreference.xls worksheet containing additional project and studies data

	A	B	C	D	E	F	G	H	I	J	K	W	X
1	OBJECTID	GNIS_ID	MEAS	Distance	moreinfo	statname	dwrabbrev	wdid	usgsstatid	datasource	status	MEAS_ACT	MEAS_ACTrnd
2	1	00183164	62519.05	42.66696694	http://www.dw	NF SOUTH PLATTE F	NORGENCO		06706000	USGS	Historic	38.8475351	38.8
3	2	00183164	512.405	-12.0894441	http://www.dw	NF SOUTH PLATTE F	NORSOPCO		06707000	USGS	Historic	0.31839368	0.3
4	3	00183363	7193.732	-1.24985325	http://www.dw	PLUM CREEK AT TIT	PLUTIRCO		06709530	USGS	Active	4.46997754	4.5
5	4	00201759	384879.2	38.57717099	http://www.dw	THIRTY-SIXTH STRE	THISIXCO		06714100	USGS	Historic	239.152839	239.2
6	5	00201759	379760.9	15.34822434	http://www.dw	SOUTH PLATTE R AT	PLASIXCO		06714215	USGS	Active	235.972456	236
7	6	00181545	22325.51	7.94168553	http://www.dw	RALSTON CREEK AE	RALARECO		06719740	USGS	Historic	13.8724268	13.9
8	7	00201759	361682.5	11.18260444	http://www.dw	SOUTH PLATTE RIVE	PLAHENCO		06720500	DWR	Active	224.739066	224.7
9	8	00181231	13475.07	24.94836479	http://www.dw	WALNUT CREEK AT	WALROCCO		06720780	USGS	Historic	8.37301824	8.4
10	9	00201759	333146.3	-14.2659486	http://www.dw	SOUTH PLATTE RIVE	PLALUPCO		06721000	USGS	Active	207.007535	207
11	10	00178354	979.5106	-30.6016548	http://www.dw	BOULDER CREEK A	BOCLONCO		06730500	USGS	Historic	0.60863967	0.6

Figure 7. GagesHistoric_SP.xls worksheet containing historical stream gage data (many columns omitted from figure, MEAS_ACT is stream mile)

	A	B	C	D	E	F	G	H	I	AB	AC
1	OBJECTID	GNIS_ID	MEAS	Distance	moreinfo	statname	dwrabbrev	wdid	usgsstatid	MEAS_ACT	MEAS_ACTrnd
2	1	00180974	26527.0755	-6.230015314	http://www.dwr.:	SOUTH BOULDER CREEK BELOW (	BOCBGRCO		06729450	16.48316051	16.5
3	2	00180974	17278.8361	-32.20729698	http://www.dwr.:	SOUTH BOULDER CREEK NEAR EL	BOCELSCO			10.73657099	10.7
4	3	00180974	17282.5529	-32.20729698	http://www.dwr.:	SOUTH BOULDER CREEK NEAR EL	BOCELSCO			10.73888047	10.7
5	4	00180974	17283.4873	-31.85110243	http://www.dwr.:	SOUTH BOULDER CREEK DIVERSI(	BOSDELCO	0600564		10.73946109	10.7
6	5	00205019	59879.9004	-38.21514033	http://www.dwr.:	CHARLES HANSEN FEEDER CANAL	HFCBBSCO	0400691		37.2076451	37.2
7	6	00178246	33256.2557	-33.56154014	http://www.dwr.:	LEFT HAND DIVERSION NEAR WAF	LEFTHDCO	0502000		20.66447927	20.7
8	7	00177961	45323.2397	-24.3331896	http://www.dwr.:	LITTLE THOMPSON RIVER AT CANY	LTCANYCO			28.16255551	28.2
9	8	00201759	415041.948	-16.06780416	http://www.dwr.:	SOUTH PLATTE RIVER BELOW CH/	PLACHACO			257.8951101	257.9
10	9	00183164	62655.61	47.80649788	http://www.dwr.:	NORTH FORK SOUTH PLATTE RIVEI	PLAGRACO			38.9323911	38.9
11	10	00201759	553248.289	-4.492728594	http://www.dwr.:	SOUTH PLATTE RIVER ABOVE SPIN	PLASPICO	2302903	06694920	343.7725488	343.8

Figure 8. GagesRealtime_SP.xls worksheet containing real-time stream gage data (many columns omitted from figure, MEAS_ACT is stream mile)

	A	B	C	I F	G	H	I	J	K	L	M	N	O
1	GNIS_ID	MEAS_ACT	MEAS_ACTtrun	WD	ID	NAME	CIU	DIV	COUNTY	ST	WATER_SRC	UTM_X	UTM_Y
2	00178190	8.426125353	8.4	5	511	LONGMONT NORTH PIPELINE	A	1	BOULDER	CO	N F ST VRAIN CREEK	470572	4453265
3	00178190	4.07335492	4	5	512	LYONS PIPELINE	A	1	BOULDER	CO	N F ST VRAIN CREEK	474755.8	4455519.5
4	00178190	1.044818196	1	5	516	LYONS DITCH	U	1	BOULDER	CO	N F ST VRAIN CREEK	476827.6	4452938.4
5	00178246	2.875907796	2.8	5	518	HALL N&S DITCHES S FORK	I	1	BOULDER	CO	S F ST VRAIN CREEK	474141	4450368.4
6	00178246	0.84225206	0.8	5	519	REESE STILES DITCH	A	1	BOULDER	CO	S F ST VRAIN CREEK	476356	4451468
7	00178246	1.009339458	1	5	520	SOUTH LEDGE DITCH	A	1	BOULDER	CO	S F ST VRAIN CREEK	476291	4451269
8	00178190	1.044818196	1	5	521	MEADOW DITCH	A	1	BOULDER	CO	S F ST VRAIN CREEK	476827.6	4452938.4
9	00178246	0.78419095	0.7	5	522	LONGMONT SOUTH PIPELINE	A	1	BOULDER	CO	S F ST VRAIN CREEK	476405	4451535
10	00205012	31.62379336	31.6	5	526	HIGHLAND DITCH	A	1	BOULDER	CO	ST VRAIN CREEK	477935	4451697
11	00205012	31.13303153	31.1	5	527	ROUGH READY DITCH	A	1	BOULDER	CO	ST VRAIN CREEK	478485	4451370
12	00205012	31.12560664	31.1	5	528	ST VRAIN PALMERTON DITCH	A	1	BOULDER	CO	ST VRAIN CREEK	478496	4451365

Figure 9. Diversions_St_Vrain_ex_area_Events.xls worksheet containing key diversion structure data data (many columns omitted from figure, MEAS_ACT is stream mile)

Appendix B – TSTool Command File

The following TSTool command file "SouthPlatte-Examples-StreamMileAnalysis.TSTool" is used to process the GIS output into the final SMRF Excel file. The following is a version from a point in time and a newer version may be in use subsequent to publication of this memorandum.

```
# Use log file name that is ignored by Dropbox
StartLog(LogFile="~$SouthPlatte-Examples-StreamMileAnalysis.TSTool.log")
# South Platte/Metro Basin Implementation Plan Stream Mile Analysis
#--------------------------------------------------------------------
# History:
# 2015-03-03 Steve Malers, Open Water Foundation
# - add tabs for attributes and focus area definitions
# - set comment width to 6 columns to try to minimize wrap, which causes comment box to cut off
for long text
# - use updated stream gage data that has truncated instead of rounded stream mile, now start
segment is always correct
# 2015-03-01 Steve Malers, Open Water Foundation
# - add comments for ISF and projects reflecting related data.
# 2015-02-08 Steve Malers, Open Water Foundation
# - full version containing focus areas, attributes, ISF reaches, projects, and gage locations
#
#--------------------------------------------------------------------
# This command file processes the GIS output of .1-mile segmented stream segments and creates an
Excel workbook and worksheets,
# each of which match an example area for the South Platte/Metro BIP.
#
# Read the main data sets and join them to create a full .1-mile segmented data set:
#  - Read the focus area list
#  - Read the attribute list
#  - Read the focus area/attribute stream mile segment data from Excel
#  - Read the instream flow stream mile segment data from Excel and join
#  - Read the project/study stream mile segment data from Excel and join
#  - Read historical stream gage location data from Excel and join (note this is just locations,
not streamflow analysis)
#  - Read diversion structure locations from Excel and join (deal with multiple diversions in .1-
mile segment)
#  - Read real-time stream gage location data from Excel and join (note this is just locations,
not streamflow analysis)
#
# Filter the joined data set and create worksheets for each example area of interest:
#  - Filter the joined data set by focus area, stream mile, etc.
#  - Output to an Excel worksheet
#
# Add additional data to the workbook:
#  - History
#  - Definitions for focus areas, attributes, etc.
#  - Linked data that does not fit well in the main worksheets (more data for projects, etc.)
#
#--------------------------------------------------------------------
# Focus area and attribute lists - definitions that are passed through to final workbook
```

```
ReadTableFromExcel(TableID="FocusAreas0",InputFile="..\From-BIP-Phase1\Focus Areas Table 7-28-14-
EditedForSMF.xlsx",ExcelAddress="B3:G47",ExcelColumnNames=FirstRowInRange,ExcelIntegerColumns="Se
gment #")
CopyTable(TableID="FocusAreas0",NewTableID="FocusAreas",ColumnMap="Segment
Description:FocusAreaName,Segment #:FocusAreaID",ColumnExcludeFilters="Segment Description:")
# E&R Attributes
ReadTableFromExcel(TableID="E&RAttributes",InputFile="..\From-BIP-Phase1\Attributes and
Categories - 5-8-14_WJM edits w percent-
EditedForSMF.xlsx",Worksheet="Categories",ExcelAddress="A4:D51",ExcelColumnNames=FirstRowInRange)
# BIP Example Areas
ReadTableFromExcel(TableID="BIPExampleAreas",InputFile="..\From-BIP-
Phase2\BIPExampleAreas.xlsx",ExcelAddress="A1:B5",ExcelColumnNames=FirstRowInRange)
# Focus areas and attributes - from GIS work that joined attributes with SWRF layer
# First read the full table that contains stream mile data overlaid with attributes, for all
focus areas.
# Also clear out the rows that have blank segment number (focus area number).
# This is an artifact of processing (TODO: will Paul remove in the GIS script?).
ReadTableFromExcel(TableID="FAonSWRFandAttributes",InputFile="..\From-SWRF-
GISProcessing\FAonSWRFandAttributes2.xls",Worksheet="FAonSWRFandAttributes",ExcelColumnNames=Firs
tRowInRange)
# Create a column that joins GNIS_ID and FMEAS to create a unique value that can be sorted.
# This avoids the issue of roundoff with floating point stream mile.
FormatTableString(TableID="FAonSWRFandAttributes",InputColumns="GNIS_ID,FMEAS",Format="%s_%05.1f"
,OutputColumn="GNIS_ID_FMEAS",InsertBeforeColumn="FMEAS")
# ReadTableFromDBF(TableID="BIPph1FocusAreasTable",InputFile="BIPph1FocusAreasTable.dbf")
#
CopyTable(TableID="BIPph1FocusAreasTable",NewTableID="BIPph1FocusArea1Table_NonBlankSegmentNo",Co
lumnExcludeFilters="Segment_No:")
# Copy the initial table into a new copy that will be manipulated
# Rename a few columns to be more appropriate for the final result
CopyTable(TableID="FAonSWRFandAttributes",NewTableID="SouthPlatteStreamMileSegments",ColumnMap="S
egment:FocusArea,Segment_No:FocusAreaID")
#----------------------------------------------------------------------
# ISF reaches - from CWCB ISF reach layer
# Read the data where ISF reaches are listed in one column, comma-separated
ReadTableFromExcel(TableID="ISF_IDs",InputFile="..\From-SWRF-
GISProcessing\ISF_Data.xls",Worksheet="ISF_Data",ExcelColumnNames=FirstRowInRange)
# The following was read using the GIS table where Paul Schwindt did manual work to create ID1,
ID2, etc. columns
#
ReadTableFromExcel(TableID="ISF_IDs",InputFile="FAonSWRFandAttributes2.xls",Worksheet="ISF_IDs",E
xcelColumnNames=FirstRowInRange)
# Create a column that joins GNIS_ID and FMEAS to create a unique value that can be sorted.
# This avoids the issue of roundoff with floating point stream mile.
FormatTableString(TableID="ISF_IDs",InputColumns="GNIS_ID,FMEAS",Format="%s_%05.1f",OutputColumn=
"GNIS_ID_FMEAS",InsertBeforeColumn="FMEAS")
# Now join the SWRF/focus area/attribute table with the SWRF/ISF table (will do the same below
with projects)
JoinTables(TableID="SouthPlatteStreamMileSegments",TableToJoinID="ISF_IDs",JoinColumns="GNIS_ID_F
MEAS:GNIS_ID_FMEAS",JoinMethod=JoinIfInBoth)
# Read ISF reach additional data to be joined to stream mile segments
ReadTableFromExcel(TableID="ISF_IDReference",InputFile="..\From-SWRF-
GISProcessing\ISF_IDreference.xls",Worksheet="ISF_IDReference",ExcelColumnNames=FirstRowInRange)
#----------------------------------------------------------------------
# Projects / methods / studies - from previous NCNA geodatabase
# Read the data where Project IDs are listed in one column, comma-separated
ReadTableFromExcel(TableID="Project_IDs",InputFile="..\From-SWRF-
GISProcessing\ProjStud_Data.xls",Worksheet="ProjStud_Data",ExcelColumnNames=FirstRowInRange)
# Create a column that joins GNIS_ID and FMEAS to create a unique value that can be sorted.
# This avoids the issue of roundoff with floating point stream mile.
FormatTableString(TableID="Project_IDs",InputColumns="GNIS_ID,FMEAS",Format="%s_%05.1f",OutputCol
umn="GNIS_ID_FMEAS",InsertBeforeColumn="FMEAS")
# Now join the SWRF/focus area/attribute table with the project/study table
JoinTables(TableID="SouthPlatteStreamMileSegments",TableToJoinID="Project_IDs",JoinColumns="GNIS_
ID_FMEAS:GNIS_ID_FMEAS",JoinMethod=JoinIfInBoth)
# Read project and methods additional data to be joined to stream mile segments
ReadTableFromExcel(TableID="ProjStud_IDReference",InputFile="..\From-SWRF-
GISProcessing\ProjStud_IDreference.xls",Worksheet="ProjStud_IDReference",ExcelColumnNames=FirstRo
wInRange)
#----------------------------------------------------------------------
```

```
# Stream gages with historical data - from CDSS website
ReadTableFromExcel(TableID="StreamGageHistorical_IDs",InputFile="..\From-SWRF-
GISProcessing\GagesHistoric_SP.xls",Worksheet="GagesHistoric_SP",ExcelColumnNames=FirstRowInRange
)
# Create a column that joins GNIS_ID and MEAS_ACTtrun to create a unique value that can be
sorted.
# This avoids the issue of roundoff with floating point stream mile.
FormatTableString(TableID="StreamGageHistorical_IDs",InputColumns="GNIS_ID,MEAS_ACTtrun",Format="
%s_%05.1f",OutputColumn="GNIS_ID_FMEAS",InsertBeforeColumn="MEAS")
# Now join the SWRF/focus area/attribute table with the historical streamgage table
JoinTables(TableID="SouthPlatteStreamMileSegments",TableToJoinID="StreamGageHistorical_IDs",JoinC
olumns="GNIS_ID_FMEAS:GNIS_ID_FMEAS",IncludeColumns="usgsstatid,dwrabbrev,statname,meas_act",Colu
mnMap="usgsstatid:SGHist_usgsstatid,dwrabbrev:SGHist_dwrabbrev,statname:SGHist_statname,meas_act:
SGHist_meas_act",JoinMethod=JoinIfInBoth)
#----------------------------------------------------------------------
# Stream gages with real-time data - from CDSS website
ReadTableFromExcel(TableID="StreamGageRT_IDs",InputFile="..\From-SWRF-
GISProcessing\GagesRealtime_SP.xls",Worksheet="GagesRealtime_SP",ExcelColumnNames=FirstRowInRange
)
# Create a column that joins GNIS_ID and MEAS_ACTtrun to create a unique value that can be
sorted.
# This avoids the issue of roundoff with floating point stream mile.
FormatTableString(TableID="StreamGageRT_IDs",InputColumns="GNIS_ID,MEAS_ACTtrun",Format="%s_%05.1
f",OutputColumn="GNIS_ID_FMEAS",InsertBeforeColumn="MEAS")
# Now join the SWRF/focus area/attribute table with the real-time streamgage table
JoinTables(TableID="SouthPlatteStreamMileSegments",TableToJoinID="StreamGageRT_IDs",JoinColumns="
GNIS_ID_FMEAS:GNIS_ID_FMEAS",IncludeColumns="usgsstatid,dwrabbrev,statname,meas_act",ColumnMap="u
sgsstatid:SGReal_usgsstatid,dwrabbrev:SGReal_dwrabbrev,statname:SGReal_statname,meas_act:SGReal_m
eas_act",JoinMethod=JoinIfInBoth)
#----------------------------------------------------------------------
# Diversion structures - hand-selected list of key diversions in basin
# One diversion input file for each example area
# Example Area 1
# Lower South Platte: (example area = South Platte at Balzac gage)
ReadTableFromExcel(TableID="LowerSouthPlatte_Diversion_Table_Events",InputFile="..\From-SWRF-
GISProcessing\Diversions_Balzac_ex_area_Events.xls",Worksheet="Diversions_Balzac_ex_area_Event",E
xcelColumnNames=FirstRowInRange)
# Create a column that joins GNIS_ID and MEAS_ACTtrun to create a unique value that can be
sorted.
# This avoids the issue of roundoff with floating point stream mile.
FormatTableString(TableID="LowerSouthPlatte_Diversion_Table_Events",InputColumns="GNIS_ID,MEAS_AC
Ttrun",Format="%s_%05.1f",OutputColumn="GNIS_ID_FMEAS",InsertBeforeColumn="MEAS_ACT")
# Now join the SWRF/focus area/attribute table with the diversion structure table
JoinTables(TableID="SouthPlatteStreamMileSegments",TableToJoinID="LowerSouthPlatte_Diversion_Tabl
e_Events",JoinColumns="GNIS_ID_FMEAS:GNIS_ID_FMEAS",IncludeColumns="ID_LABEL7,NAME,MEAS_ACT",Colu
mnMap="ID_LABEL7:DivWDID,NAME:DivName,MEAS_ACT:DivMEAS_ACT",JoinMethod=JoinIfInBoth,HandleMultipl
eJoinMatchesHow=NumberColumns)
# Example Area 2
# Northern Region/Transitional: (example area = St Vrain @ Lyons Gage)
# One diversion input file for each example area
ReadTableFromExcel(TableID="St_Vrain_Diversion_Table_Events",InputFile="..\From-SWRF-
GISProcessing\Diversions_St_Vrain_ex_area_Events.xls",Worksheet="St_Vrain_Diversion_Table_Events"
,ExcelColumnNames=FirstRowInRange)
# Create a column that joins GNIS_ID and MEAS_ACTtrun to create a unique value that can be
sorted.
# This avoids the issue of roundoff with floating point stream mile.
FormatTableString(TableID="St_Vrain_Diversion_Table_Events",InputColumns="GNIS_ID,MEAS_ACTtrun",F
ormat="%s_%05.1f",OutputColumn="GNIS_ID_FMEAS",InsertBeforeColumn="MEAS_ACT")
# Now join the SWRF/focus area/attribute table with the diversion structure table
JoinTables(TableID="SouthPlatteStreamMileSegments",TableToJoinID="St_Vrain_Diversion_Table_Events
",JoinColumns="GNIS_ID_FMEAS:GNIS_ID_FMEAS",IncludeColumns="ID_LABEL7,NAME,MEAS_ACT",ColumnMap="I
D_LABEL7:DivWDID,NAME:DivName,MEAS_ACT:DivMEAS_ACT",JoinMethod=JoinIfInBoth,HandleMultipleJoinMat
chesHow=NumberColumns)
# Example Area 3
# Upper South Platte/Mountain: (example area = South Platte Below Elevenmile Gage)
ReadTableFromExcel(TableID="SouthPlatteMountain_Diversion_Table_Events",InputFile="..\From-SWRF-
GISProcessing\Diversions_Elevenmile_ex_area_Events.xls",Worksheet="Diversions_Elevenmile_ex_area_
E",ExcelColumnNames=FirstRowInRange)
# Create a column that joins GNIS_ID and MEAS_ACTtrun to create a unique value that can be
sorted.
```

```
# This avoids the issue of roundoff with floating point stream mile.
FormatTableString(TableID="SouthPlatteMountain_Diversion_Table_Events",InputColumns="GNIS_ID,MEAS
_ACTtrun",Format="%s_%05.1f",OutputColumn="GNIS_ID_FMEAS",InsertBeforeColumn="MEAS_ACT")
# Now join the SWRF/focus area/attribute table with the diversion structure table
JoinTables(TableID="SouthPlatteStreamMileSegments",TableToJoinID="SouthPlatteMountain_Diversion_T
able_Events",JoinColumns="GNIS_ID_FMEAS:GNIS_ID_FMEAS",IncludeColumns="ID_LABEL7,NAME,MEAS_ACT",C
olumnMap="ID_LABEL7:DivWDID,NAME:DivName,MEAS_ACT:DivMEAS_ACT",JoinMethod=JoinIfInBoth,HandleMult
ipleJoinMatchesHow=NumberColumns)
# Example Area 4
# Metro Corridor: (example area = South Platte Below Chatfield Gage)
ReadTableFromExcel(TableID="MetroCorridor_Diversion_Table_Events",InputFile="..\From-SWRF-
GISProcessing\Diversions_Chatfield_ex_area_Events.xls",Worksheet="Diversions_Chatfield_ex_area_Ev
",ExcelColumnNames=FirstRowInRange)
# Create a column that joins GNIS_ID and MEAS_ACTtrun to create a unique value that can be
sorted.
# This avoids the issue of roundoff with floating point stream mile.
FormatTableString(TableID="MetroCorridor_Diversion_Table_Events",InputColumns="GNIS_ID,MEAS_ACTtr
un",Format="%s_%05.1f",OutputColumn="GNIS_ID_FMEAS",InsertBeforeColumn="MEAS_ACT")
# Now join the SWRF/focus area/attribute table with the diversion structure table
JoinTables(TableID="SouthPlatteStreamMileSegments",TableToJoinID="MetroCorridor_Diversion_Table_E
vents",JoinColumns="GNIS_ID_FMEAS:GNIS_ID_FMEAS",IncludeColumns="ID_LABEL7,NAME,MEAS_ACT",ColumnM
ap="ID_LABEL7:DivWDID,NAME:DivName,MEAS_ACT:DivMEAS_ACT",JoinMethod=JoinIfInBoth,HandleMultipleJo
inMatchesHow=NumberColumns)
#----------------------------------------------------------------------
# Example Area 1
# Lower South Platte: (example area = South Platte at Balzac gage)
# Focus Area 1
# Gage location is in the gagesII_9322_sept30_2011 shapefile on the server, FID = 4966, STAID =
06760000; as this focus area runs nearly the full length of the lower river it is located in
COMID 3561770
# Would like to look at least 6 miles up and downstream from this point, more if time permits as
gage moved ~5 miles in 1987.
CopyTable(TableID="SouthPlatteStreamMileSegments",NewTableID="ExampleArea1_LowerSouthPlatte",Colu
mnFilters="FocusAreaID:1")
# Split the ISF_ID column into separate columns for each ISF reach - done here because only a
small number of output columns will result
SplitTableColumn(TableID="ExampleArea1_LowerSouthPlatte",ColumnToSplit="ISF_ID",Delimiter=",",Out
putColumns="ISF_[1:]",OutputColumnOrder=UniqueValuesSorted,InsertBeforeColumn="ISF_ID",DeleteOrig
inalColumn=False)
# Split the Project_ID column into separate columns for each project - done here because only a
small number of output columns will result
SplitTableColumn(TableID="ExampleArea1_LowerSouthPlatte",ColumnToSplit="ProjectID",Delimiter=",",
OutputColumns="PRJ_[1:]",OutputColumnOrder=UniqueValuesSorted,InsertBeforeColumn="ProjectID",Dele
teOriginalColumn=False)
# Sort by the GNIS_ID and FMEAS so output will be by stream and then segment in stream
SortTable(TableID="ExampleArea1_LowerSouthPlatte",SortColumns="GNIS_ID_FMEAS")
#----------------------------------------------------------------------
# Example Area 2
# Northern Region/Transitional: (example area = St Vrain @ Lyons Gage)
#     Focus Areas 14 (and 17 downstream) (see more below re: gap)
#     Gage location is in the gagesII_9322_sept30_2011 shapefile on the server, FID = 4938, STAID
= 06724000; FID = 4966, STAID = 06760000; located in COMID 2888628 or COMID 2888654
#     This is where there is a section of the St Vrain missing from the Focus Areas, it appears
COMID 2889866  (and maybe COMID 2889630) should have been both Env and Rec from version 2, but
not included in V3, so Paul, please check this in the latest Focus Areas layer.
#     Would like to look at least 5 miles up and downstream from this point, more if time permits
as there are lots of different attributes in this area.
# Doing the filter by focus areas does not work well here.  Just grab all the Saint Vrain Creeks
#
CopyTable(TableID="SouthPlatteStreamMileSegments",NewTableID="ExampleArea2_NorthernTransitional",
ColumnFilters="FocusAreaID:14")
#
CopyTable(TableID="SouthPlatteStreamMileSegments",NewTableID="ExampleArea2_NorthernTransitional_F
A17",ColumnFilters="FocusAreaID:17")
#
AppendTable(TableID="ExampleArea2_NorthernTransitional",AppendTableID="ExampleArea2_NorthernTrans
itional_FA17")
CopyTable(TableID="SouthPlatteStreamMileSegments",NewTableID="ExampleArea2_NorthernTransitional",
ColumnFilters="GNIS_Name:*Saint Vrain Creek*")
```

```
# Split the ISF_ID column into separate columns for each ISF reach - done here because only a
small number of output columns will result
SplitTableColumn(TableID="ExampleArea2_NorthernTransitional",ColumnToSplit="ISF_ID",Delimiter=","
,OutputColumns="ISF_[1:]",OutputColumnOrder=UniqueValuesSorted,InsertBeforeColumn="ISF_ID",Delete
OriginalColumn=False)
# Split the Project_ID column into separate columns for each project - done here because only a
small number of output columns will result
SplitTableColumn(TableID="ExampleArea2_NorthernTransitional",ColumnToSplit="ProjectID",Delimiter=
",",OutputColumns="PRJ_[1:]",OutputColumnOrder=UniqueValuesSorted,InsertBeforeColumn="ProjectID",
DeleteOriginalColumn=False)
# Sort by the GNIS_ID and FMEAS so output will be by stream and then segment in stream
SortTable(TableID="ExampleArea2_NorthernTransitional",SortColumns="GNIS_ID_FMEAS")
#-----------------------------------------------------------------------
# Example Area 3
# Upper South Platte/Mountain: (example area = South Platte Below Elevenmile Gage)
#     Focus Area 7
#     Gage location is in the gagesII_9322_sept30_2011 shapefile on the server, FID = 4895, STAID
= 06695000; located in COMID 5241238
#     Would like to look at least 5 miles up and downstream from this point, more if time permits
due to varying attributes.
CopyTable(TableID="SouthPlatteStreamMileSegments",NewTableID="ExampleArea3_SouthPlatteMountain",C
olumnFilters="FocusAreaID:7")
# Split the ISF_ID column into separate columns for each ISF reach - done here because only a
small number of output columns will result
SplitTableColumn(TableID="ExampleArea3_SouthPlatteMountain",ColumnToSplit="ISF_ID",Delimiter=",",
OutputColumns="ISF_[1:]",OutputColumnOrder=UniqueValuesSorted,InsertBeforeColumn="ISF_ID",DeleteO
riginalColumn=False)
# Split the Project_ID column into separate columns for each project - done here because only a
small number of output columns will result
SplitTableColumn(TableID="ExampleArea3_SouthPlatteMountain",ColumnToSplit="ProjectID",Delimiter="
,",OutputColumns="PRJ_[1:]",OutputColumnOrder=UniqueValuesSorted,InsertBeforeColumn="ProjectID",D
eleteOriginalColumn=False)
# Sort by the GNIS_ID and FMEAS so output will be by stream and then segment in stream
SortTable(TableID="ExampleArea3_SouthPlatteMountain",SortColumns="GNIS_ID_FMEAS")
#-----------------------------------------------------------------------
# Example Area 4
# Metro Corridor: (example area = South Platte Below Chatfield Gage)
#     Focus Area 4
#     The gage location is NOT in the gagesII_9322_sept30_2011 shapefile on the server, the gage
there is simply a placeholder for a quick map. Please add the location from the DNR data:
(Location - Lat. N39°33'45"; Long. W105°03'35" (NAD83) in Jefferson County, CO Hydrologic Unit
10190002. Gage is located on the left bank 815 ft. downstream from the outlet works of Chatfield
Reservoir. ) COMID likely 188657 or 188319
#     Would like to look at least 5 miles downstream from the reservoir, more if time permits due
to different attributes/tributaries in area. Perhaps even extend this down to the South Platte
Below Union @ Englewood Gage, for two stream flow points, if time permits.
CopyTable(TableID="SouthPlatteStreamMileSegments",NewTableID="ExampleArea4_MetroCorridor",ColumnF
ilters="FocusAreaID:4")
# Split the ISF_ID column into separate columns for each ISF reach - done here because only a
small number of output columns will result
SplitTableColumn(TableID="ExampleArea4_MetroCorridor",ColumnToSplit="ISF_ID",Delimiter=",",Output
Columns="ISF_[1:]",OutputColumnOrder=UniqueValuesSorted,InsertBeforeColumn="ISF_ID",DeleteOrigina
lColumn=False)
# Split the Project_ID column into separate columns for each project - done here because only a
small number of output columns will result
SplitTableColumn(TableID="ExampleArea4_MetroCorridor",ColumnToSplit="ProjectID",Delimiter=",",Out
putColumns="PRJ_[1:]",OutputColumnOrder=UniqueValuesSorted,InsertBeforeColumn="ProjectID",DeleteO
riginalColumn=False)
# Sort by the GNIS_ID and FMEAS so output will be by stream and then segment in stream
SortTable(TableID="ExampleArea4_MetroCorridor",SortColumns="GNIS_ID_FMEAS")
#-----------------------------------------------------------------------
# Create an Excel workbook with worksheets for each Example Area
NewExcelWorkbook(OutputFile="SouthPlatte-StreamMile-
Analysis.xlsx",Worksheets="E&RAttributes,FocusAreas,BIPExampleAreas,LowerSouthPlatte,MetroCorrido
r,SouthPlatteMountain,NorthernTransitional",KeepOpen=True)
#-----------------------------------------------------------------------
WriteTableToExcel(TableID="FocusAreas",OutputFile="SouthPlatte-StreamMile-
Analysis.xlsx",Worksheet="FocusAreas",ExcelAddress="A1",ExcelColumnNames=FirstRowInRange,KeepOpen
=True,ColumnWidths="Default:Auto")
```

```
WriteTableToExcel(TableID="E&RAttributes",OutputFile="SouthPlatte-StreamMile-
Analysis.xlsx",Worksheet="E&RAttributes",ExcelAddress="A1",ExcelColumnNames=FirstRowInRange,KeepO
pen=True,ColumnWidths="Default:Auto")
WriteTableToExcel(TableID="BIPExampleAreas",OutputFile="SouthPlatte-StreamMile-
Analysis.xlsx",Worksheet="BIPExampleAreas",ExcelAddress="A1",ExcelColumnNames=FirstRowInRange,Kee
pOpen=True,ColumnWidths="Default:Auto")
#------------------------------------------------------------------------
# 1. LowerSouthPlatte
WriteTableToExcel(TableID="ExampleArea1_LowerSouthPlatte",OutputFile="SouthPlatte-StreamMile-
Analysis.xlsx",Worksheet="LowerSouthPlatte",ExcelAddress="A1",ExcelColumnNames=FirstRowInRange,Ke
epOpen=True,ColumnWidths="Default:Auto,EmptyColumns:128,FocusArea:2400,Rationale:2200,ProjectID:2
200",ColumnDecimalPlaces="FMEAS:1,TMEAS:1")
# Set the project column heading to include each project's data
For(Name="ForLowerSouthPlatteProject",IteratorProperty="Project_Count",List="PRJ_1,PRJ_2,PRJ_3,PR
J_4,PRJ_5,PRJ_6,PRJ_7,PRJ_8,PRJ_9,PRJ_10,PRJ_11,PRJ_12,PRJ_13,PRJ_14,PRJ_15,PRJ_16,PRJ_17,PRJ_18,
PRJ_19,PRJ_20,PRJ_21,PRJ_22,PRJ_23,PRJ_24,PRJ_25,PRJ_26,PRJ_27,PRJ_28,PRJ_29,PRJ_30,PRJ_31,PRJ_32
,PRJ_33,PRJ_34,PRJ_35,PRJ_36,PRJ_37,PRJ_38,PRJ_39,PRJ_40,PRJ_41,PRJ_42,PRJ_43,PRJ_44,PRJ_45,PRJ_4
6,PRJ_47,PRJ_48,PRJ_49,PRJ_50,PRJ_51,PRJ_52,PRJ_53,PRJ_54,PRJ_55,PRJ_56,PRJ_57,PRJ_58,PRJ_59,PRJ_
60,PRJ_61,PRJ_62,PRJ_63,PRJ_64,PRJ_65,PRJ_66,PRJ_67,PRJ_68,PRJ_69,PRJ_70,PRJ_71,PRJ_72,PRJ_73,PRJ
_74,PRJ_75,PRJ_76,PRJ_77,PRJ_78,PRJ_79,PRJ_80,PRJ_81,PRJ_82,PRJ_83,PRJ_84,PRJ_85,PRJ_86,PRJ_87,PR
J_88,PRJ_89,PRJ_90,PRJ_91,PRJ_92,PRJ_93,PRJ_94,PRJ_95,PRJ_96,PRJ_97,PRJ_98,PRJ_99")
#For(Name="ForLowerSouthPlatteProject",IteratorProperty="Project_Count",List="PRJ_1")
# First join the project information (for PRJ_1 for example), naming joined columns with leading
"X_" to indicate not written
JoinTables(TableID="ExampleArea1_LowerSouthPlatte",TableToJoinID="ProjStud_IDReference",JoinColum
ns="${Project_Count}:ProjectID",ColumnMap="ProjectLocation:X_${Project_Count}_ProjectLocation,Pro
jectName:X_${Project_Count}_ProjectName,ProjectCategory:X_${Project_Count}_ProjectCategory,Projec
tType:X_${Project_Count}_ProjectType,ProjectStatus:X_${Project_Count}_ProjectStatus,ProjectNote:X
_${Project_Count}_ProjectNote,ProjectContact:X_${Project_Count}_ProjectContact")
# Next format a property from the joined columns - this is the project comment text
SetPropertyFromTable(TableID="ExampleArea1_LowerSouthPlatte",Column="${Project_Count}",ColumnExcl
udeFilters="X_${Project_Count}_ProjectName:",PropertyName="ProjectID")
SetPropertyFromTable(TableID="ExampleArea1_LowerSouthPlatte",Column="X_${Project_Count}_ProjectNa
me",ColumnExcludeFilters="X_${Project_Count}_ProjectName:",PropertyName="ProjectName")
SetPropertyFromTable(TableID="ExampleArea1_LowerSouthPlatte",Column="X_${Project_Count}_ProjectLo
cation",ColumnExcludeFilters="X_${Project_Count}_ProjectLocation:",PropertyName="ProjectLocation"
)
SetPropertyFromTable(TableID="ExampleArea1_LowerSouthPlatte",Column="X_${Project_Count}_ProjectCa
tegory",ColumnExcludeFilters="X_${Project_Count}_ProjectCategory:",PropertyName="ProjectCategory"
)
SetPropertyFromTable(TableID="ExampleArea1_LowerSouthPlatte",Column="X_${Project_Count}_ProjectTy
pe",ColumnExcludeFilters="X_${Project_Count}_ProjectType:",PropertyName="ProjectType")
SetPropertyFromTable(TableID="ExampleArea1_LowerSouthPlatte",Column="X_${Project_Count}_ProjectSt
atus",ColumnExcludeFilters="X_${Project_Count}_ProjectStatus:",PropertyName="ProjectStatus")
SetPropertyFromTable(TableID="ExampleArea1_LowerSouthPlatte",Column="X_${Project_Count}_ProjectNo
te",ColumnExcludeFilters="X_${Project_Count}_ProjectNote:",PropertyName="ProjectNote")
SetPropertyFromTable(TableID="ExampleArea1_LowerSouthPlatte",Column="X_${Project_Count}_ProjectCo
ntact",ColumnExcludeFilters="X_${Project_Count}_ProjectContact:",PropertyName="ProjectContact",De
faultValue="Blank")
FormatStringProperty(InputProperties="ProjectID,ProjectName,ProjectLocation,ProjectCategory,Proje
ctType,ProjectStatus,ProjectNote,ProjectContact",Format="ProjectID:%s\nName:%s\nLocation:%s\nCate
gory:%s\nType:%s\nStatus:%s\nNote:%s\nContact:%s",OutputProperty="ProjectComment")
SetExcelCell(OutputFile="SouthPlatte-StreamMile-
Analysis.xlsx",Worksheet="LowerSouthPlatte",KeepOpen=True,IncludeColumns="${Project_Count}",Rows=
"1",Comment="${ProjectComment}",CommentWidth="6")
EndFor(Name="ForLowerSouthPlatteProject")
SetExcelWorksheetViewProperties(OutputFile="SouthPlatte-StreamMile-
Analysis.xlsx",Worksheet="LowerSouthPlatte",FreezePaneColumnRightOfSplit=D,FreezePaneRowBelowSpli
t=2,KeepOpen=True)
# 2. NorthernTransitional
WriteTableToExcel(TableID="ExampleArea2_NorthernTransitional",OutputFile="SouthPlatte-StreamMile-
Analysis.xlsx",Worksheet="NorthernTransitional",ExcelAddress="A1",ExcelColumnNames=FirstRowInRang
e,KeepOpen=True,ColumnWidths="Default:Auto,EmptyColumns:128,FocusArea:2400,Rationale:2200,Project
ID:2200",ColumnDecimalPlaces="FMEAS:1,TMEAS:1")
# Set the instream flow reach column heading to include each ISF's data
For(Name="ForNorthernTransitionalISF",IteratorProperty="ISF_Count",List="ISF_1,ISF_2,ISF_3,ISF_4,
ISF_5")
# For(Name="ForNorthernTransitionalISF",IteratorProperty="ISF_Count",List="ISF_1")
# First join the ISF information (for ISF_1 for example), naming joined columns with leading "X_"
to indicate not written
```

```
JoinTables(TableID="ExampleArea2_NorthernTransitional",TableToJoinID="ISF_IDReference",JoinColumn
s="${ISF_Count}:ID",ColumnMap="ID:X_${ISF_Count}_ISFID,ISF_Type:X_${ISF_Count}_ISFType,Case_Numbe
:X_${ISF_Count}_ISFCaseNumber,Status:X_${ISF_Count}_ISFStatus")
# Next format a property from the joined columns - this is the ISF comment text
SetPropertyFromTable(TableID="ExampleArea2_NorthernTransitional",Column="X_${ISF_Count}_ISFID",Co
lumnExcludeFilters="X_${ISF_Count}_ISFID:",PropertyName="ISFID")
SetPropertyFromTable(TableID="ExampleArea2_NorthernTransitional",Column="X_${ISF_Count}_ISFType",
ColumnExcludeFilters="X_${ISF_Count}_ISFType:",PropertyName="ISFType")
SetPropertyFromTable(TableID="ExampleArea2_NorthernTransitional",Column="X_${ISF_Count}_ISFCaseNu
mber",ColumnExcludeFilters="X_${ISF_Count}_ISFCaseNumber:",PropertyName="ISFCaseNumber")
SetPropertyFromTable(TableID="ExampleArea2_NorthernTransitional",Column="X_${ISF_Count}_ISFStatus
",ColumnExcludeFilters="X_${ISF_Count}_ISFStatus:",PropertyName="ISFStatus")
FormatStringProperty(InputProperties="ISFID,ISFType,ISFCaseNumber,ISFStatus",Format="ISFID:%s\nIS
FType:%s\nISFCaseNumber:%s\nISFStatus:%s",OutputProperty="ISFComment")
SetExcelCell(OutputFile="SouthPlatte-StreamMile-
Analysis.xlsx",Worksheet="NorthernTransitional",KeepOpen=True,IncludeColumns="${ISF_Count}",Rows=
"1",Comment="${ISFComment}",CommentWidth="6")
EndFor(Name="ForNorthernTransitionalISF")
# Set the project column heading to include each project's data
For(Name="ForNorthernTransitionalProject",IteratorProperty="Project_Count",List="PRJ_1,PRJ_2,PRJ_
3,PRJ_4,PRJ_5,PRJ_6,PRJ_7,PRJ_8,PRJ_9,PRJ_10,PRJ_11,PRJ_12,PRJ_13,PRJ_14,PRJ_15,PRJ_16,PRJ_17,PRJ
_18,PRJ_19,PRJ_20,PRJ_21,PRJ_22,PRJ_23,PRJ_24")
# For(Name="ForNorthernTransitionalProject",IteratorProperty="Project_Count",List="PRJ_1")
# First join the project information (for PRJ_1 for example), naming joined columns with leading
"X_" to indicate not written
JoinTables(TableID="ExampleArea2_NorthernTransitional",TableToJoinID="ProjStud_IDReference",JoinC
olumns="${Project_Count}:ProjectID",ColumnMap="ProjectLocation:X_${Project_Count}_ProjectLocation
,ProjectName:X_${Project_Count}_ProjectName,ProjectCategory:X_${Project_Count}_ProjectCategory,Pr
ojectType:X_${Project_Count}_ProjectType,ProjectStatus:X_${Project_Count}_ProjectStatus,ProjectNo
te:X_${Project_Count}_ProjectNote,ProjectContact:X_${Project_Count}_ProjectContact")
# Next format a property from the joined columns - this is the project comment text
SetPropertyFromTable(TableID="ExampleArea2_NorthernTransitional",Column="${Project_Count}",Column
ExcludeFilters="X_${Project_Count}_ProjectName:",PropertyName="ProjectID")
SetPropertyFromTable(TableID="ExampleArea2_NorthernTransitional",Column="X_${Project_Count}_Proje
ctName",ColumnExcludeFilters="X_${Project_Count}_ProjectName:",PropertyName="ProjectName")
SetPropertyFromTable(TableID="ExampleArea2_NorthernTransitional",Column="X_${Project_Count}_Proje
ctLocation",ColumnExcludeFilters="X_${Project_Count}_ProjectLocation:",PropertyName="ProjectLocat
ion")
SetPropertyFromTable(TableID="ExampleArea2_NorthernTransitional",Column="X_${Project_Count}_Proje
ctCategory",ColumnExcludeFilters="X_${Project_Count}_ProjectCategory:",PropertyName="ProjectCateg
ory")
SetPropertyFromTable(TableID="ExampleArea2_NorthernTransitional",Column="X_${Project_Count}_Proje
ctType",ColumnExcludeFilters="X_${Project_Count}_ProjectType:",PropertyName="ProjectType")
SetPropertyFromTable(TableID="ExampleArea2_NorthernTransitional",Column="X_${Project_Count}_Proje
ctStatus",ColumnExcludeFilters="X_${Project_Count}_ProjectStatus:",PropertyName="ProjectStatus")
SetPropertyFromTable(TableID="ExampleArea2_NorthernTransitional",Column="X_${Project_Count}_Proje
ctNote",ColumnExcludeFilters="X_${Project_Count}_ProjectNote:",PropertyName="ProjectNote")
SetPropertyFromTable(TableID="ExampleArea2_NorthernTransitional",Column="X_${Project_Count}_Proje
ctContact",ColumnExcludeFilters="X_${Project_Count}_ProjectContact:",PropertyName="ProjectContact
",DefaultValue="Blank")
FormatStringProperty(InputProperties="ProjectID,ProjectName,ProjectLocation,ProjectCategory,Proje
ctType,ProjectStatus,ProjectNote,ProjectContact",Format="ProjectID:%s\nName:%s\nLocation:%s\nCate
gory:%s\nType:%s\nStatus:%s\nNote:%s\nContact:%s",OutputProperty="ProjectComment")
SetExcelCell(OutputFile="SouthPlatte-StreamMile-
Analysis.xlsx",Worksheet="NorthernTransitional",KeepOpen=True,IncludeColumns="${Project_Count}",R
ows="1",Comment="${ProjectComment}",CommentWidth="6")
EndFor(Name="ForNorthernTransitionalProject")
SetExcelWorksheetViewProperties(OutputFile="SouthPlatte-StreamMile-
Analysis.xlsx",Worksheet="NorthernTransitional",FreezePaneColumnRightOfSplit=D,FreezePaneRowBelow
Split=2,KeepOpen=True)
# 3. SouthPlatteMountain
WriteTableToExcel(TableID="ExampleArea3_SouthPlatteMountain",OutputFile="SouthPlatte-StreamMile-
Analysis.xlsx",Worksheet="SouthPlatteMountain",ExcelAddress="A1",ExcelColumnNames=FirstRowInRange
,KeepOpen=True,ColumnWidths="Default:Auto,EmptyColumns:128,FocusArea:2400,Rationale:2200,ProjectI
D:2200",ColumnDecimalPlaces="FMEAS:1,TMEAS:1")
# Set the instream flow reach column heading to include each ISF's data
For(Name="ForSouthPlatteMountainISF",IteratorProperty="ISF_Count",List="ISF_1")
# For(Name="ForSouthPlatteMountainISF",IteratorProperty="ISF_Count",List="ISF_1")
# First join the ISF information (for ISF_1 for example), naming joined columns with leading "X_"
to indicate not written
```

```
JoinTables(TableID="ExampleArea3_SouthPlatteMountain",TableToJoinID="ISF_IDReference",JoinColumns
="${ISF_Count}:ID",ColumnMap="ID:X_${ISF_Count}_ISFID,ISF_Type:X_${ISF_Count}_ISFType,Case_Numbe:
X_${ISF_Count}_ISFCaseNumber,Status:X_${ISF_Count}_ISFStatus")
# Next format a property from the joined columns - this is the ISF comment text
SetPropertyFromTable(TableID="ExampleArea3_SouthPlatteMountain",Column="X_${ISF_Count}_ISFID",Col
umnExcludeFilters="X_${ISF_Count}_ISFID:",PropertyName="ISFID")
SetPropertyFromTable(TableID="ExampleArea3_SouthPlatteMountain",Column="X_${ISF_Count}_ISFType",C
olumnExcludeFilters="X_${ISF_Count}_ISFType:",PropertyName="ISFType")
SetPropertyFromTable(TableID="ExampleArea3_SouthPlatteMountain",Column="X_${ISF_Count}_ISFCaseNum
ber",ColumnExcludeFilters="X_${ISF_Count}_ISFCaseNumber:",PropertyName="ISFCaseNumber")
SetPropertyFromTable(TableID="ExampleArea3_SouthPlatteMountain",Column="X_${ISF_Count}_ISFStatus"
,ColumnExcludeFilters="X_${ISF_Count}_ISFStatus:",PropertyName="ISFStatus")
FormatStringProperty(InputProperties="ISFID,ISFType,ISFCaseNumber,ISFStatus",Format="ISFID:%s\nIS
FType:%s\nISFCaseNumber:%s\nISFStatus:%s",OutputProperty="ISFComment")
SetExcelCell(OutputFile="SouthPlatte-StreamMile-
Analysis.xlsx",Worksheet="SouthPlatteMountain",KeepOpen=True,IncludeColumns="${ISF_Count}",Rows="
1",Comment="${ISFComment}",CommentWidth="6")
EndFor(Name="ForSouthPlatteMountainISF")
# Set the project column heading to include each project's data
For(Name="ForSouthPlatteMountainProject",IteratorProperty="Project_Count",List="PRJ_1,PRJ_2,PRJ_3
,PRJ_4,PRJ_5,PRJ_6,PRJ_7,PRJ_8,PRJ_9,PRJ_10,PRJ_11,PRJ_12,PRJ_13,PRJ_14,PRJ_15,PRJ_16,PRJ_17,PRJ_
18,PRJ_19,PRJ_20,PRJ_21,PRJ_22,PRJ_23,PRJ_24,PRJ_25,PRJ_26,PRJ_27,PRJ_28,PRJ_29,PRJ_30,PRJ_31,PRJ
_32,PRJ_33,PRJ_34,PRJ_35,PRJ_36,PRJ_37,PRJ_38,PRJ_39")
# For(Name="ForSouthPlatteMountainProject",IteratorProperty="Project_Count",List="PRJ_1")
# First join the project information (for PRJ_1 for example), naming joined columns with leading
"X_" to indicate not written
JoinTables(TableID="ExampleArea3_SouthPlatteMountain",TableToJoinID="ProjStud_IDReference",JoinCo
lumns="${Project_Count}:ProjectID",ColumnMap="ProjectLocation:X_${Project_Count}_ProjectLocation,
ProjectName:X_${Project_Count}_ProjectName,ProjectCategory:X_${Project_Count}_ProjectCategory,Pro
jectType:X_${Project_Count}_ProjectType,ProjectStatus:X_${Project_Count}_ProjectStatus,ProjectNot
e:X_${Project_Count}_ProjectNote,ProjectContact:X_${Project_Count}_ProjectContact")
# Next format a property from the joined columns - this is the project comment text
SetPropertyFromTable(TableID="ExampleArea3_SouthPlatteMountain",Column="${Project_Count}",ColumnE
xcludeFilters="X_${Project_Count}_ProjectName:",PropertyName="ProjectID")
SetPropertyFromTable(TableID="ExampleArea3_SouthPlatteMountain",Column="X_${Project_Count}_Projec
tName",ColumnExcludeFilters="X_${Project_Count}_ProjectName:",PropertyName="ProjectName")
SetPropertyFromTable(TableID="ExampleArea3_SouthPlatteMountain",Column="X_${Project_Count}_Projec
tLocation",ColumnExcludeFilters="X_${Project_Count}_ProjectLocation:",PropertyName="ProjectLocati
on")
SetPropertyFromTable(TableID="ExampleArea3_SouthPlatteMountain",Column="X_${Project_Count}_Projec
tCategory",ColumnExcludeFilters="X_${Project_Count}_ProjectCategory:",PropertyName="ProjectCatego
ry")
SetPropertyFromTable(TableID="ExampleArea3_SouthPlatteMountain",Column="X_${Project_Count}_Projec
tType",ColumnExcludeFilters="X_${Project_Count}_ProjectType:",PropertyName="ProjectType")
SetPropertyFromTable(TableID="ExampleArea3_SouthPlatteMountain",Column="X_${Project_Count}_Projec
tStatus",ColumnExcludeFilters="X_${Project_Count}_ProjectStatus:",PropertyName="ProjectStatus")
SetPropertyFromTable(TableID="ExampleArea3_SouthPlatteMountain",Column="X_${Project_Count}_Projec
tNote",ColumnExcludeFilters="X_${Project_Count}_ProjectNote:",PropertyName="ProjectNote")
SetPropertyFromTable(TableID="ExampleArea3_SouthPlatteMountain",Column="X_${Project_Count}_Projec
tContact",ColumnExcludeFilters="X_${Project_Count}_ProjectContact:",PropertyName="ProjectContact"
,DefaultValue="Blank")
FormatStringProperty(InputProperties="ProjectID,ProjectName,ProjectLocation,ProjectCategory,Proje
ctType,ProjectStatus,ProjectNote,ProjectContact",Format="ProjectID:%s\nName:%s\nLocation:%s\nCate
gory:%s\nType:%s\nStatus:%s\nNote:%s\nContact:%s",OutputProperty="ProjectComment")
SetExcelCell(OutputFile="SouthPlatte-StreamMile-
Analysis.xlsx",Worksheet="SouthPlatteMountain",KeepOpen=True,IncludeColumns="${Project_Count}",Ro
ws="1",Comment="${ProjectComment}",CommentWidth="6")
EndFor(Name="ForSouthPlatteMountainProject")
SetExcelWorksheetViewProperties(OutputFile="SouthPlatte-StreamMile-
Analysis.xlsx",Worksheet="SouthPlatteMountain",FreezePaneColumnRightOfSplit=D,FreezePaneRowBelowS
plit=2,KeepOpen=True)
# 4. MetroCorridor
WriteTableToExcel(TableID="ExampleArea4_MetroCorridor",OutputFile="SouthPlatte-StreamMile-
Analysis.xlsx",Worksheet="MetroCorridor",ExcelAddress="A1",ExcelColumnNames=FirstRowInRange,KeepO
pen=True,ColumnWidths="Default:Auto,EmptyColumns:128,FocusArea:2400,Rationale:2200,ProjectID:2200
",ColumnDecimalPlaces="FMEAS:1,TMEAS:1")
# Set the project column heading to include each project's data
For(Name="ForMetroCorridorProject",IteratorProperty="Project_Count",List="PRJ_1,PRJ_2,PRJ_3,PRJ_4
,PRJ_5,PRJ_6,PRJ_7,PRJ_8,PRJ_9,PRJ_10,PRJ_11,PRJ_12,PRJ_13,PRJ_14")
# For(Name="ForMetroCorridorProject",IteratorProperty="Project_Count",List="PRJ_1")
```

```
# First join the project information (for PRJ_1 for example), naming joined columns with leading
"X_" to indicate not written
JoinTables(TableID="ExampleArea4_MetroCorridor",TableToJoinID="ProjStud_IDReference",JoinColumns=
"${Project_Count}:ProjectID",ColumnMap="ProjectLocation:X_${Project_Count}_ProjectLocation,Projec
tName:X_${Project_Count}_ProjectName,ProjectCategory:X_${Project_Count}_ProjectCategory,ProjectTy
pe:X_${Project_Count}_ProjectType,ProjectStatus:X_${Project_Count}_ProjectStatus,ProjectNote:X_${
Project_Count}_ProjectNote,ProjectContact:X_${Project_Count}_ProjectContact")
# Next format a property from the joined columns - this is the project comment text
SetPropertyFromTable(TableID="ExampleArea4_MetroCorridor",Column="${Project_Count}",ColumnExclude
Filters="X_${Project_Count}_ProjectName:",PropertyName="ProjectID")
SetPropertyFromTable(TableID="ExampleArea4_MetroCorridor",Column="X_${Project_Count}_ProjectName"
,ColumnExcludeFilters="X_${Project_Count}_ProjectName:",PropertyName="ProjectName")
SetPropertyFromTable(TableID="ExampleArea4_MetroCorridor",Column="X_${Project_Count}_ProjectLocat
ion",ColumnExcludeFilters="X_${Project_Count}_ProjectLocation:",PropertyName="ProjectLocation")
SetPropertyFromTable(TableID="ExampleArea4_MetroCorridor",Column="X_${Project_Count}_ProjectCateg
ory",ColumnExcludeFilters="X_${Project_Count}_ProjectCategory:",PropertyName="ProjectCategory")
SetPropertyFromTable(TableID="ExampleArea4_MetroCorridor",Column="X_${Project_Count}_ProjectType"
,ColumnExcludeFilters="X_${Project_Count}_ProjectType:",PropertyName="ProjectType")
SetPropertyFromTable(TableID="ExampleArea4_MetroCorridor",Column="X_${Project_Count}_ProjectStatu
s",ColumnExcludeFilters="X_${Project_Count}_ProjectStatus:",PropertyName="ProjectStatus")
SetPropertyFromTable(TableID="ExampleArea4_MetroCorridor",Column="X_${Project_Count}_ProjectNote"
,ColumnExcludeFilters="X_${Project_Count}_ProjectNote:",PropertyName="ProjectNote")
SetPropertyFromTable(TableID="ExampleArea4_MetroCorridor",Column="X_${Project_Count}_ProjectConta
ct",ColumnExcludeFilters="X_${Project_Count}_ProjectContact:",PropertyName="ProjectContact",Defau
ltValue="Blank")
FormatStringProperty(InputProperties="ProjectID,ProjectName,ProjectLocation,ProjectCategory,Proje
ctType,ProjectStatus,ProjectNote,ProjectContact",Format="ProjectID:%s\nName:%s\nLocation:%s\nCate
gory:%s\nType:%s\nStatus:%s\nNote:%s\nContact:%s",OutputProperty="ProjectComment")
SetExcelCell(OutputFile="SouthPlatte-StreamMile-
Analysis.xlsx",Worksheet="MetroCorridor",KeepOpen=True,IncludeColumns="${Project_Count}",Rows="1"
,Comment="${ProjectComment}",CommentWidth="6")
EndFor(Name="ForMetroCorridorProject")
SetExcelWorksheetViewProperties(OutputFile="SouthPlatte-StreamMile-
Analysis.xlsx",Worksheet="MetroCorridor",FreezePaneColumnRightOfSplit=D,FreezePaneRowBelowSplit=2
,KeepOpen=True)
#
CloseExcelWorkbook(OutputFile="SouthPlatte-StreamMile-Analysis.xlsx")
```

General Information (compiled from SWSI NCNA data and documents)										SWSI NCNA Phase 1 GeoDatabase (SWSI_NCNA_PH1_BASIN_DA	
Layer Group	Layer Name, Descriptive (Spatial Unit)	Content	SWSI Attribute Category	SWSI Dependency	SWSI/BIP Attribute Group	SWSI/BIP Attribute	SWSI/BIP Attribute Category	Stream Proximity	Water-related Measureable Outcome	Feature Class	Geometry Type
Attribute	Bald Eagles (Sites)	Active nesting sites				Active Bald Eagle Nests	NA	Near stream	Streamflow	ATTRIBUTE1_Bald_EaglE_Active_Nestsites_SP	Polygon
Attribute	Birding (Sites)	National Audobon Society birding areas				Audobon Important Bird Areas	Waterfowl Hunting/Viewing	Near Stream	Streamflow	ATTRIBUTE7_Audobon_Bird_Areas_SP	Point
Attribute	Birding (HUCs)	12-digit HUC distribution for National Audobon Society birding areas				Audobon Important Bird Areas	Waterfowl Hunting/Viewing	Near Stream	Streamflow	ATTRIBUTE7_huc12_nrcs_Audobon_Bird_Areas_SP	Polygon
Attribute	Boating, Flatwater (Lakes)	Boatable waters				Flatwater Boating	Recreation	In Lake	Lake Level	ATTRIBUTE5_CO_Boatable_Waters_SP	Polygon
Attribute	Boating, Kayaking (Stream Reaches)	Kayaking reaches				Whitewater Boating	Recreation	In Stream	Streamflow	ATTRIBUTE5_SouthPlatteKayaking	Line
Attribute	Boating, Rafting (Stream Reaches)	Rafting reaches				Whitewater Boating	Recreation	In Stream	Streamflow	ATTRIBUTE5_SouthPlatteRafting	Line
Attribute	Boreal Toad (Sites)	Known breeding sites	1			Boreal Toad	State Endangered, Threatened, Species of Concern	Near stream	Wetland?	ATTRIBUTE1_BorealToad_SP	Point
Attribute	Boreal Toad (HUCs)	12-digit HUC distribution for species	1			Boreal Toad	State Endangered, Threatened, Species of Concern	Near stream	Wetland?	ATTRIBUTE1_huc12_nrcs_BorealToad_SP	Polygon
Attribute	Brassy Minnow (HUCs)	12-digit HUC distribution for species	2			Brassy Minnow	Plains Fish State Endangered, Threatened, Species of Concern	In stream	Streamflow	ATTRIBUTE1_Brassy_Minnow_SP	Polygon
Attribute	Common Garter Snake (Sites)	Breeding sites? No metadata.	4			Common Garter Snake	State Endangered, Threatened, Species of Concern	Near stream	Streamflow	ATTRIBUTE1_CommonGarterSnake_SP	Point
Attribute	Common Garter Snake (HUCs)	12-digit HUC distribution for species	4			Common Garter Snake	State Endangered, Threatened, Species of Concern	Near stream	Streamflow	ATTRIBUTE1_huc12_nrcs_CommonGartGerSnake_SP	Polygon
Attribute	Common Shiner (HUCs)	12-digit HUC distribution for species	2			Common Shiner	Plains Fish State Endangered, Threatened, Species of Concern	In stream	Streamflow	ATTRIBUTE1_Common_Shiner_SP	Polygon
Attribute	Ducks Unlimited Projects (Sites)	Ducks Unlimited Projects				Ducks Unlimited Projects	Waterfowl Hunting/Viewing	Near Stream	Wetland?	ATTRIBUTE7_Ducks_Unlimited_Projects_SP	Point
Attribute	Ducks Unlimited Projects (HUCs)	12-digit HUC distribution for Ducks Unlimited Projects				Ducks Unlimited Projects	Waterfowl Hunting/Viewing	Near Stream	Wetland?	ATTRIBUTE7_huc12_nrcs_Ducks_Unlimited_Projects_SP	Polygon
Attribute	Fishing, Reservoir (Lakes)	Reservoir fishing				Reservoir and Lake Fishing	Fishing	In lake	Lake Level	ATTRIBUTE6_Reservoir_Lake_Fishing	Polygon
Attribute	Fishing, Stream (Stream Reaches)	Stream fishing				River and Stream Fishing	Fishing	In stream	Streamflow	ATTRIBUTE6_River_Stream_Fishing	Line
Attribute	Gold Medal Fishing (Lakes)	Gold Medal fishing lakes				Gold Medal Trout Lakes	Fishing	In lake	Lake Level	ATTRIBUTE6_Gold_Medal_Lakes	Polygon
Attribute	Gold Medal Fishing (Stream Reaches)	Gold Medal fishing streams				Gold Medal Trout Streams	Fishing	In stream	Streamflow	ATTRIBUTE6_Gold_Medal_Streams	Polygon
Attribute	Greenback Cutthroat Trout (Lakes)	Lakes with Greenback Cutthroat	1			Greenback Cutthroat Trout	Greenback Cutthroat Trout	In lake	Lake Level	ATTRIBUTE1_GreenbackCutthroatTrout_Lakes_SP	Polygon
Attribute	Greenback Cutthroat Trout (Stream Reaches)	Streams with Greenback Cutthroat	1			Greenback Cutthroat Trout	Greenback Cutthroat Trout	In stream	Streamflow	ATTRIBUTE1_GreenbackCutthroatTrout_Streams_SP	Line
Attribute	Instream Flow Reaches, 2005 (Stream Reaches)	Instream flow reaches, 2005.				CWCB Instream Flow Rights	NA	In stream	Streamflow	ATTRIBUTE4_isfstreams2005_SP	Line
Attribute	Instream Flow Reaches, 2010 (Stream Reaches)	Instream flow reaches, 2010.				CWCB Instream Flow Rights	NA	In stream	Streamflow	ATTRIBUTE4_isfstreams_2010_SP	Line
Attribute	Instream Flow Reaches, 2010 pending (Stream Reaches)	Instream flow reaches, 2010, pending				CWCB Instream Flow Rights	NA	In stream	Streamflow	ATTRIBUTE4_MetroSplatteBasins_PendingStreams_2010_SP	Line
Attribute	Iowa Darter (HUCs)	12-digit HUC distribution for species				Iowa Darter	Plains Fish State Endangered, Threatened, Species of Concern	In stream	Streamflow	ATTRIBUTE1_Iowa_Darter_SP	Polygon
Attribute	Lake Chub (Lakes)	Lakes with Lake Chub	3			Lake Chub	State Endangered, Threatened, Species of Concern	In lake	Streamflow	ATTRIBUTE1_LakeChub_Lakes_SP	Polygon
Attribute	Lake Chub (Stream Reaches)	Stream Reaches with Lake Chub	3			Lake Chub	State Endangered, Threatened, Species of Concern	In stream	Streamflow	ATTRIBUTE1_LakeChub_Streams_SP	Line
Attribute	Lake Levels, 2005 (Lakes)	CWCB protected lakes, as of 2005				CWCB Natural Lake Level Water Rights	NA	In lake	Lake Level	ATTRIBUTE4_isflakes2005_SP	Polygon
Attribute	Lake Levels, 2005 (HUCs)	12-digit HUC distribution for CWCB protected lakes, as of 2005				CWCB Natural Lake Level Water Rights	NA	In lake	Lake Level	ATTRIBUTE4_huc12_nrcs_isflakes2005_SP	Polygon
Attribute	Lake Levels, 2006 (Lakes)	CWCB protected lakes, as of 2006				CWCB Natural Lake Level Water Rights	NA	In lake	Lake Level	ATTRIBUTE4_isflakes2006_SP	Polygon

General Information (con**TA.gdb/METRO_SOUTHPLATTE)**			**SWSI NCNA Phase 2 GeoDatabase (SWSI_NCNA_PHS2_BASIN_DATA.gdb/METRO_SOUTHPLATTE)**				**BIP Phase 1 (many SWSI_NCNA_PH1_BASIN_DATA.gdb feature classes exported t**	
Layer Group	Source	Note	Feature Class	Geometry Type	Source	Note	Shapefile or Feature Class	Note
Attribute	CDOW	Locations are circles representing buffers around sites, essentially points.					ATTRIBUTE1_Bald_EaglE_Active_Nestsites_SP.shp	
Attribute	National Audobon Society	All point layers were not processed. All of their features were present in their reespective polygon layers.					ATTRIBUTE7_Audubon_Bird_Areas_SP.shp	All point layers were not processed. All of their features were present in their reespective polygon layers.
Attribute	USDA, CDOW						ATTRIBUTE7_huc12_nrcs_Audubon_Bird_Areas_SP.shp	
Attribute	CO State Parks						ATTRIBUTE5_CO_Boatable_Waters_SP.shp	
Attribute	?						ATTRIBUTE5_SouthPlatteKayaking.shp	
Attribute	?						ATTRIBUTE5_SouthPlatteRafting.shp	
Attribute	CDOW	All point layers were not processed. All of their features were present in their reespective polygon layers.					ATTRIBUTE1_BorealToad_SP.shp	All point layers were not processed. All of their features were present in their reespective polygon layers.
Attribute	USDA, CDOW	Need to confirm process to create HUC layer from sites.					ATTRIBUTE1_huc12_nrcs_BorealToad_SP.shp	
Attribute	CDOW						ATTRIBUTE1_Brassy_Minnow_SP.shp	
Attribute	CDOW	All point layers were not processed. All of their features were present in their reespective polygon layers.					ATTRIBUTE1_CommonGarterSnake_SP.shp	All point layers were not processed. All of their features were present in their reespective polygon layers.
Attribute	USDA, CDOW	Need to confirm process to create HUC layer from sites.					ATTRIBUTE1_huc12_nrcs_CommonGarterSnake_SP.shp	
Attribute	CDOW						ATTRIBUTE1_Common_Shiner_SP.shp	
Attribute	Ducks Unlimited?	All point layers were not processed. All of their features were present in their reespective polygon layers.					ATTRIBUTE7_Ducks_Unlimited_Projects_SP.shp	All point layers were not processed. All of their features were present in their reespective polygon layers.
Attribute	USDA						ATTRIBUTE7_huc12_nrcs_Ducks_Unlimited_Projects_SP.shp	
Attribute	?						ATTRIBUTE6_Reservoir_Lake_Fishing.shp	
Attribute	USGS, CDOW						ATTRIBUTE6_River_Stream_Fishing.shp	
Attribute	CDOW						ATTRIBUTE6_Gold_Medal_Lakes.shp	
Attribute	CDOW						ATTRIBUTE6_Gold_Medal_Streams.shp	
Attribute	CDOW						ATTRIBUTE1_GreenbackCutthroatTrout_Lakes_SP.shp	
Attribute	CDOW						ATTRIBUTE1_GreenbackCutthroatTrout_Streams_SP.shp	
Attribute	CWCB	Can get most recent data from bottom of page: http://cdss.state.co.us/GIS/Pages/DataByCategory.aspx					ATTRIBUTE4_isfstreams2005_SP.shp	
Attribute	CWCB	Can get most recent data from bottom of page: http://cdss.state.co.us/GIS/Pages/DataByCategory.aspx					ATTRIBUTE4_isfstreams_2010.shp	
Attribute	CWCB	Need to get the latest ISF reach layer.					ATTRIBUTE4_MetroSplatteBasin_PendingStreams_2010.shp	
Attribute	CDOW						ATTRIBUTE1_Iowa_Darter_SP.shp	
Attribute	CDOW						ATTRIBUTE1_LakeChub_Lakes_SP.shp	
Attribute	CDOW						ATTRIBUTE1_LakeChub_Streams_SP.shp	
Attribute	CWCB	Need to get latest version from CWCB.					ATTRIBUTE4_isflakes2005_SP.shp	
Attribute	CWCB	Need to get latest version based on above.					ATTRIBUTE4_huc12_nrcs_isflakes2005_SP.shp	
Attribute	CWCB	Need to get latest version from CWCB.					ATTRIBUTE4_isflakes2006.shp	

General Information (con	BIP Phase 2 New Data				BIP Phase 2 Stream Mile Representation				
Layer Group	Layer or Feature Class	Geometry Type	Source	Note	Layer or Feature Class Referenced to SWRF	Feature Class Attribute Name(s)	Geometry Type	Layer or Feature Class with Mile Markers to Export to Excel	Note
Attribute					ATTRIBUTE1_Bald_EaglE_Active_Nestsites_SP.shp	BaldEagle	Polygon		
Attribute					ATTRIBUTE7_Audubon_Bird_Areas_SP.shp		Point		All point layers were not processed. All of their features were present in their reespective polygon layers.
Attribute					ATTRIBUTE7_huc12_nrcs_Audubon_Bird_Areas_SP.shp	BirdArea	Polygon		
Attribute					ATTRIBUTE5_CO_Boatable_Waters_SP.shp	FlatwaterBoating	Polygon		
Attribute					ATTRIBUTE5_SouthPlatteKayaking.shp	KayakWhitewater	Line		
Attribute					ATTRIBUTE5_SouthPlatteRafting.shp	RaftWhitewater	Line		
Attribute					ATTRIBUTE1_BorealToad_SP.shp		Point		All point layers were not processed. All of their features were present in their reespective polygon layers.
Attribute					ATTRIBUTE1_huc12_nrcs_BorealToad_SP.shp	BorealToad	Polygon		
Attribute					ATTRIBUTE1_Brassy_Minnow_SP.shp	BrassyMinnow	Polygon		
Attribute					ATTRIBUTE1_CommonGarterSnake_SP.shp		Point		All point layers were not processed. All of their features were present in their reespective polygon layers.
Attribute					ATTRIBUTE1_huc12_nrcs_CommonGarterSnake_SP.shp	ComGarterSnake	Polygon		
Attribute					ATTRIBUTE1_Common_Shiner_SP.shp	ComShiner	Polygon		
Attribute					ATTRIBUTE7_Ducks_Unlimited_Projects_SP.shp		Point		All point layers were not processed. All of their features were present in their reespective polygon layers.
Attribute					ATTRIBUTE7_huc12_nrcs_Ducks_Unlimited_Projects_SP.shp	DucksUnProjects	Polygon		
Attribute					ATTRIBUTE6_Reservoir_Lake_Fishing.shp	LakeFishing	Polygon		
Attribute					ATTRIBUTE6_River_Stream_Fishing.shp	StreamFishing	Line		
Attribute					ATTRIBUTE6_Gold_Medal_Lakes.shp	GMTroutLake	Polygon		
Attribute					ATTRIBUTE6_Gold_Medal_Streams.shp	GMTroutStream	Polygon		
Attribute					ATTRIBUTE1_GreenbackCutthroatTrout_Lakes_SP.shp	GBCuttLake	Polygon		
Attribute					ATTRIBUTE1_GreenbackCutthroatTrout_Streams_SP.shp	GBCuttStream	Line		
Attribute					ATTRIBUTE4_isfstreams2005_SP.shp		Line		
Attribute					ATTRIBUTE4_isfstreams_2010.shp		Line		
Attribute					ATTRIBUTE4_MetroSplatteBasin_PendingStreams_2010.shp		Line		
Attribute					ATTRIBUTE1_Iowa_Darter_SP.shp	IowaDarter	Polygon		
Attribute					ATTRIBUTE1_LakeChub_Lakes_SP.shp	LakeChubLake	Polygon		
Attribute					ATTRIBUTE1_LakeChub_Streams_SP.shp	LakeChubStream	Line		
Attribute					ATTRIBUTE4_isflakes2005_SP.shp		Polygon		
Attribute					ATTRIBUTE4_huc12_nrcs_isflakes2005_SP.shp		Polygon		
Attribute					ATTRIBUTE4_isflakes2006.shp		Polygon		

General Information (compiled from SWSI NCNA data and documents)										SWSI NCNA Phase 1 GeoDatabase (SWSI_NCNA_PH1_BASIN_DA	
Layer Group	Layer Name, Descriptive (Spatial Unit)	Content	SWSI Attribute Category	SWSI Dependency	SWSI/BIP Attribute Group	SWSI/BIP Attribute	SWSI/BIP Attribute Category	Stream Proximity	Water-related Measureable Outcome	Feature Class	Geometry Type
Attribute	Municipal Recreational Corridors (Stream Reaches)	Municipal recreational corridors (trails next to streams)				?		Near stream		ATTRIBUTE8_Municipal_Rec_Corridors_SP	Line
Attribute	Northern Cricket Frog (Sites)	Sites with Northern Cricket Frog				Northern Cricket Frog	State Endangered, Threatened, Species of Concern	In stream?	Streamflow	ATTRIBUTE2_Northern_Cricket_Frog_SP	Point
Attribute	Northern Cricket Frog (HUCs)	12-digit HUC distribution for species				Northern Cricket Frog	State Endangered, Threatened, Species of Concern	In stream?	Streamflow	ATTRIBUTE2_huc12_nrcs_Northern_Cricket_Frog_SP	Polygon
Attribute	Northern Leopard Frog (Sites)	12-digit HUC distribution for species	4			Northern Leopard Frog	State Endangered, Threatened, Species of Concern	In stream?	Streamflow	ATTRIBUTE2_Northern_Leopard_Frog_SP	Point
Attribute	Northern Leopard Frog (HUCs)	12-digit HUC distribution for species	4			Northern Leopard Frog	State Endangered, Threatened, Species of Concern	In stream?	Streamflow	ATTRIBUTE2_huc12_nrcs_Northern_Leopard_Frog_SP	Polygon
Attribute	Northern Redbelly Dace (HUCs)	12-digit HUC distribution for species	3			Northern Redbelly Dace	Plains Fish State Endangered, Threatened, Species of Concern	In stream	Streamflow	ATTRIBUTE1_Northern_Redbelly_Dace_SP	Polygon
Attribute	Outstanding and Wilderness Area Waters (Stream Reaches)	Special value waters.				Wilderness Waters	NA	In stream	Streamflow	ATTRIBUTE4_CO_Outstanding_and_wilderness_area_waters_SP	Line
Attribute	Outstanding Waters (Stream Reaches)	Special value waters.				Colorado Outstanding Waters	NA	In stream	Streamflow	ATTRIBUTE4_CO_Outstanding_Waters_SP	Line
Attribute	Plains Leopard Frog (Sites)	Sites with Plains Leopard Frog				Plains Leopard Frog	State Endangered, Threatened, Species of Concern	In stream?	Streamflow	ATTRIBUTE2_Plains_Leopard_Frog_SP	Point
Attribute	Plains Leopard Frog (HUCs)	12-digit HUC distribution for species				Plains Leopard Frog	State Endangered, Threatened, Species of Concern	In stream?	Streamflow	ATTRIBUTE2_huc12_nrcs_Plains_Leopard_Frog_SP	Polygon
Attribute	Plains Minnow (HUCs)	12-digit HUC distribution for species	3			Plains Minnow	Plains Fish State Endangered, Threatened, Species of Concern	In stream	Streamflow	ATTRIBUTE1_Plains_Minnow_SP	Polygon
Attribute	Plains Orangethroat Darter (HUCs)	12-digit HUC distribution for species	4			Plains Orangethroat Darter	Plains Fish State Endangered, Threatened, Species of Concern	In stream	Streamflow	ATTRIBUTE1_Orangethroat_Darter_SP	Polygon
Attribute	Preble's Meadow Jumping Mouse (Range)	Sites with Preble's Meadow Jumping Mouse	1			Preble's Meadow Jumping Mouse	State Endangered, Threatened, Species of Concern	Near stream	?	ATTRIBUTE1_pjm_occupied_range_SP	Polygon
Attribute	Preble's Meadow Jumping Mouse (Overall Range)	Preble's Meadow Jumping Mouse Overall Range	1			Preble's Meadow Jumping Mouse	State Endangered, Threatened, Species of Concern	Near stream	?	ATTRIBUTE1_pjm_overall_range_SP	Polygon
Attribute	RICDs (Stream Reaches)	Recreational In-Channel Diversions (RICDs)				Recreational In-Channel Diversion Structures	Recreation	In stream	Streamflow	ATTRIBUTES5_RICDs_SP	Line
Attribute	Riparian Habitat (Sites)	Important riparian habitat sites.				Rare Aquatic-Dependent Plants	Important Riparian Habitat	Near stream	Streamflow	ATTRIBUTE3_ARW_PLANTSL3pts_20061207_Feat_SP	Point
Attribute	Riparian Habitat (HUCs)	Important riparian habitat sites.				Rare Aquatic-Dependent Plants	Important Riparian Habitat	Near stream	Streamflow	ATTRIBUTE3_huc12_nrcs_ARW_PLANTSL3pts_20061207_Feat_SP	Polygon
Attribute	Riparian Plants (Sites)	Significant riparian wetland plant community sites.				Significant Plant Communities	Important Riparian Habitat	Near stream	Wetland	ATTRIBUTE3_SignificantRiparianWetlandPlantComms_SP	Point
Attribute	Riparian Plants (HUCs)	Significant riparian wetland plant community sites.				Significant Plant Communities	Important Riparian Habitat	Near stream	Wetland	ATTRIBUTE3_huc12_nrcs_SignificantRiparianWetlandPlantComms_SP	Polygon
Attribute	River Otter (Sites)	Sites with confirmed River Otter sightings.	3			River Otter	State Endangered, Threatened, Species of Concern	In stream	Streamflow	ATTRIBUTE1_RiverOtter_ConfirmedSightings_SP	Point
Attribute	River Otter (HUCs)	12-digit HUC distribution for species	3			River Otter	State Endangered, Threatened, Species of Concern	In stream	Streamflow	ATTRIBUTE1_huc12_nrcs_RiverOtter_ConfirmedSightings_SP	Polygon
Attribute	Stonecat (HUCs)	12-digit HUC distribution for species	3			Stonecat	Plains Fish State Endangered, Threatened, Species of Concern	In stream	Streamflow	ATTRIBUTE1_Stonecat_SP	Polygon
Attribute	Suckermouth Minnow (HUCs)	12-digit HUC distribution for species	3			Suckermouth Minnow	Plains Fish State Endangered, Threatened, Species of Concern	In stream	Streamflow	ATTRIBUTE1_Suckermouth_Minnow_SP	Polygon
Attribute	Waterfowl (Sites)	Sites with waterfowl hunting and viewing				Waterfowl Hunting/Viewing	Waterfowl Hunting/Viewing	Near stream	Wetlands?	ATTRIBUTE7_Waterfowl_Hunting_Viewing_SP	Polygon
Attribute	Wild and Scenic, Poudre (Stream Reaches)	Poudre River Wild and Scenic.				Wilderness Waters	NA	In stream	Streamflow	ATTRIBUTE4_Poudre_Wild_Scenic_SP	Line
Attribute	Wild and Scenic, Potential New (Stream Reaches)	Potential additions to Wild and Scenic.				Wilderness Waters	NA	In stream	Streamflow	ATTRIBUTE4_Potential_Additions_to_Wild_and_Scenic_SP	Line
Attribute	Wild and Scenic, South Platte Eligible (Stream Reaches)	South Platte eligible Wild and Scenic areas.				Eligible Wild and Scenic	NA	In stream	Streamflow	ATTRIBUTE4_SPBasin_Eligible_Wild_Scenic	Line

General Information (con	TA.gdb/METRO_SOUTHPLATTE)		SWSI NCNA Phase 2 GeoDatabase (SWSI_NCNA_PHS2_BASIN_DATA.gdb/METRO_SOUTHPLATTE)				BIP Phase 1 (many SWSI_NCNA_PH1_BASIN_DATA.gdb feature classes exported t	
Layer Group	Source	Note	Feature Class	Geometry Type	Source	Note	Shapefile or Feature Class	Note
Attribute	CDOW						ATTRIBUTE8_Municipal_Rec_Corridors.shp	
Attribute	USDA, CDOW	All point layers were not processed. All of their features were present in their reespective polygon layers.					ATTRIBUTE2_Northern_Cricket_Frog_SP.shp	All point layers were not processed. All of their features were present in their reespective polygon layers.
Attribute	USDA, CDOW	Need to confirm process to create HUC layer from sites.					ATTRIBUTE2_huc12_nrcs_Northern_Cricket_Frog_SP.shp	
Attribute	USDA, CDOW	All point layers were not processed. All of their features were present in their reespective polygon layers.					ATTRIBUTE2_Northern_Leopard_Frog_SP.shp	All point layers were not processed. All of their features were present in their reespective polygon layers.
Attribute	USDA, CDOW	Need to confirm process to create HUC layer from sites.					ATTRIBUTE2_huc12_nrcs_Northern_Leopard_Frog_SP.shp	
Attribute	CDOW						ATTRIBUTE1_Northern_Redbelly_Dace_SP.shp	
Attribute	BLM						ATTRIBUTE4_CO_outstanding_and_wilderness_area_waters.shp	
Attribute	BLM						ATTRIBUTE4_CO_Outstanding_Waters_SP.shp	
Attribute	USDA, CDOW	All point layers were not processed. All of their features were present in their reespective polygon layers.					ATTRIBUTE2_Plains_Leopard_Frog_SP.shp	All point layers were not processed. All of their features were present in their reespective polygon layers.
Attribute	USDA, CDOW	Need to confirm process to create HUC layer from sites.					ATTRIBUTE2_huc12_nrcs_Plains_Leopard_Frog_SP.shp	
Attribute	CDOW						ATTRIBUTE1_Plains_Minnow_SP.shp	
Attribute	CDOW						ATTRIBUTE1_Orangethroat_Darter_SP.shp	
Attribute	?						ATTRIBUTE1_pjm_occupied_range_SP.shp	
Attribute	?						ATTRIBUTE1_pjm_overall_range_SP.shp	
Attribute	CWCB	Need to get updated layer					ATTRIBUTE5_RICDs_SP.shp	
Attribute	CDOW?	All point layers were not processed. All of their features were present in their reespective polygon layers.					ATTRIBUTE3_ARW_PLANTSL3pts_20061207_Feat_SP.shp	All point layers were not processed. All of their features were present in their reespective polygon layers.
Attribute	USDA, CDOW	Need to confirm process to create HUC layer from sites.					ATTRIBUTE3_huc12_nrcs_ARW_PLANTSL3pts_20061207_Feat_SP.shp	
Attribute	CDOW?	All point layers were not processed. All of their features were present in their reespective polygon layers.					ATTRIBUTE3_SignificantRiparianWetlandPlantComms_SP.shp	All point layers were not processed. All of their features were present in their reespective polygon layers.
Attribute	USDA, CDOW	Need to confirm process to create HUC layer from sites.					ATTRIBUTE3_huc12_nrcs_SignificantRiparianWetlandPlantComms_SP.shp	
Attribute	USDA, CDOW	All point layers were not processed. All of their features were present in their reespective polygon layers.					ATTRIBUTE1_RiverOtter_ConfirmedSightings_SP.shp	All point layers were not processed. All of their features were present in their reespective polygon layers.
Attribute	USDA, CDOW	Need to confirm process to create HUC layer from sites.					ATTRIBUTE1_huc12_nrcs_RiverOtter_ConfirmedSightings_SP.shp	
Attribute	CDOW						ATTRIBUTE1_Stonecat_SP.shp	
Attribute	CDOW						ATTRIBUTE1_Suckermouth_Minnow_SP.shp	
Attribute	CDOW						ATTRIBUTE7_Waterfowl_Hunting_Viewing_Parcels.shp	
Attribute	USGS, CDOW						ATTRIBUTE4_Poudre_Wild_Scenic.shp	
Attribute	USGS, CDOW						ATTRIBUTE4_Potential_Additions_to_Wild_and_Scenic_SP.shp	
Attribute	USGS, CDOW						ATTRIBUTE4_SPBasin_Eligible_Wild_Scenic.shp	

General Information (con	BIP Phase 2 New Data				BIP Phase 2 Stream Mile Representation				
Layer Group	Layer or Feature Class	Geometry Type	Source	Note	Layer or Feature Class Referenced to SWRF	Feature Class Attribute Name(s)	Geometry Type	Layer or Feature Class with Mile Markers to Export to Excel	Note
Attribute					ATTRIBUTE8_Municipal_Rec_Corridors.shp	RecCorridor	Line		
Attribute					ATTRIBUTE2_Northern_Cricket_Frog_SP.shp		Point		All point layers were not processed. All of their features were present in their reespective polygon layers.
Attribute					ATTRIBUTE2_huc12_nrcs_Northern_Cricket_Frog_SP.shp	NCrickFrog	Polygon		
Attribute					ATTRIBUTE2_Northern_Leopard_Frog_SP.shp		Point		All point layers were not processed. All of their features were present in their reespective polygon layers.
Attribute					ATTRIBUTE2_huc12_nrcs_Northern_Leopard_Frog_SP.shp	NLeopFrog	Polygon		
Attribute					ATTRIBUTE1_Northern_Redbelly_Dace_SP.shp	NRedbellyDace	Polygon		
Attribute					ATTRIBUTE4_CO_outstanding_and_wilderness_area_waters.shp	OutWildWaters	Line		
Attribute					ATTRIBUTE4_CO_Outstanding_Waters_SP.shp	OutstWaters	Line		
Attribute					ATTRIBUTE2_Plains_Leopard_Frog_SP.shp		Point		All point layers were not processed. All of their features were present in their reespective polygon layers.
Attribute					ATTRIBUTE2_huc12_nrcs_Plains_Leopard_Frog_SP.shp	PlaLeoFrog	Polygon		
Attribute					ATTRIBUTE1_Plains_Minnow_SP.shp	PlaMinnow	Polygon		
Attribute					ATTRIBUTE1_Orangethroat_Darter_SP.shp	OrngthDarter	Polygon		
Attribute					ATTRIBUTE1_pjm_occupied_range_SP.shp	OccPrebMouse	Polygon		
Attribute					ATTRIBUTE1_pjm_overall_range_SP.shp	OvrPrebMouse	Polygon		
Attribute					ATTRIBUTE5_RICDs_SP.shp	RICDs	Line		
Attribute					ATTRIBUTE3_ARW_PLANTSL3pts_20061207_Feat_SP.shp		Point		All point layers were not processed. All of their features were present in their reespective polygon layers.
Attribute					ATTRIBUTE3_huc12_nrcs_ARW_PLANTSL3pts_20061207_Feat_SP.shp	RarePlants	Polygon		
Attribute					ATTRIBUTE3_SignificantRiparianWetlandPlantComms_SP.shp		Point		All point layers were not processed. All of their features were present in their reespective polygon layers.
Attribute					ATTRIBUTE3_huc12_nrcs_SignificantRiparianWetlandPlantComms_SP.shp	SigPlants	Polygon		
Attribute					ATTRIBUTE1_RiverOtter_ConfirmedSightings_SP.shp		Point		All point layers were not processed. All of their features were present in their reespective polygon layers.
Attribute					ATTRIBUTE1_huc12_nrcs_RiverOtter_ConfirmedSightings_SP.shp	RivOtterSight	Polygon		
Attribute					ATTRIBUTE1_Stonecat_SP.shp	Stonecat	Polygon		
Attribute					ATTRIBUTE1_Suckermouth_Minnow_SP.shp	SuckermMinnow	Polygon		
Attribute					ATTRIBUTE7_Waterfowl_Hunting_Viewing_Parcels.shp	Waterfowl	Polygon		
Attribute					ATTRIBUTE4_Poudre_Wild_Scenic.shp	PoudreScenic	Line		
Attribute					ATTRIBUTE4_Potential_Additions_to_Wild_and_Scenic_SP.shp	PotAddsW_S	Line		
Attribute					ATTRIBUTE4_SPBasin_Eligible_Wild_Scenic.shp	EligibleScenic	Line		

General Information (compiled from SWSI NCNA data and documents)										SWSI NCNA Phase 1 GeoDatabase (SWSI_NCNA_PH1_BASIN_DA	
Layer Group	Layer Name, Descriptive (Spatial Unit)	Content	SWSI Attribute Category	SWSI Dependency	SWSI/BIP Attribute Group	SWSI/BIP Attribute	SWSI/BIP Attribute Category	Stream Proximity	Water-related Measureable Outcome	Feature Class	Geometry Type
Attribute	Wilderness Area Waters, Additional (Stream Reaches)	Special value waters.				Wilderness Waters	NA	In stream	Streamflow	ATTRIBUTE4_additional_wilderness_area_waters_SP	Line
Attribute	Wood Frog (Sites)	Sites with Wood Frog				Wood Frog	State Endangered, Threatened, Species of Concern	In stream?	Streamflow	ATTRIBUTE2_Wood_Frog_SP	Point
Attribute	Wood Frog (HUCs)	12-digit HUC distribution for species				Wood Frog	State Endangered, Threatened, Species of Concern	In stream?	Streamflow	ATTRIBUTE2_huc12_nrcs_Wood_Frog_SP	Polygon
Attribute	Yellow Mud Turtle (Sites)	Sites wity Yellow Mud Turtle	3			Yellow Mud Turtle	State Endangered, Threatened, Species of Concern	Near stream	Wetland?	ATTRIBUTE1_YellowMudTurtle_SP	Point
Attribute	Yellow Mud Turtle (HUCs)	12-digit HUC distribution for species	3			Yellow Mud Turtle	State Endangered, Threatened, Species of Concern	In stream?	Wetland?	ATTRIBUTE1_huc12_nrcs_YellowMudTurtle_SP	Polygon
Stream	DWR Source Water Route Framework (SWRF)	Streams that are sources for CO water rights, based on NHD, but linework merged so 1 feature = 1 GNIS ID.									
Focus Area	Focus Area (Stream Reaches)	Focus areas referenced to NHD.						In Stream		PhaseI_SouthPlatte_Focus_Segments_2010	Line
Focus Area	Focus Area (Polygons)	Focus areas polygons near the stream reaches.						In Stream		PhaseI_SouthPlatte_Focus_Segments_2010_Polygons	Polygon
Focus Area	Park County Final Focus Segments (Line)	Focus Segments designated by Park County for BIP Phase I						In Stream			
Focus Area	Additional Focus Areas mostly from the Northern Subbasin (Line)	Focus Areas were interpreted from a string of emails saved in "CPW new focus areas 2011.pdf"						In Stream			
Focus Area	Final Focus Areas layer from BIP Phase I	Layer is a merge of ApprovedReaches.shp, ParkCoFinalFocusSegments.shp and PhaseI_SouthPlatte_Focus_Segments_2010.shp									
Projects											
Projects & Studies											
Focus Areas joined to Projects											
Focus Areas joined to Studies											
Focus Areas joined to Projects and Studies											
Base	South Platte Subbasins									SWSI_NCNA_PH1_BASIN_DATA.gdb/ METRO_SOUTH_PLATTE/ SouthPlatte_Subbasins	

General Information (conTA.gdb/METRO_SOUTHPLATTE)			SWSI NCNA Phase 2 GeoDatabase (SWSI_NCNA_PHS2_BASIN_DATA.gdb/METRO_SOUTHPLATTE)				BIP Phase 1 (many SWSI_NCNA_PH1_BASIN_DATA.gdb feature classes exported	
Layer Group	Source	Note	Feature Class	Geometry Type	Source	Note	Shapefile or Feature Class	Note
Attribute	NCNA Committee	Some streams are not in the SWRF layer (no water rights) and some are on the West Slope.					ATTRIBUTE4_additional_wilderness_area_waters.shp	
Attribute	USDA, CDOW	All point layers were not processed. All of their features were present in their reespective polygon layers.					ATTRIBUTE2_Wood_Frog_SP.shp	All point layers were not processed. All of their features were present in their reespective polygon layers.
Attribute	USDA, CDOW	Need to confirm process to create HUC layer from sites.					ATTRIBUTE2_huc12_nrcs_Wood_Frog_SP.shp	
Attribute	CDOW						ATTRIBUTE1_YellowMudTurtle_SP.shp	All point layers were not processed. All of their features were present in their reespective polygon layers.
Attribute	USDA, CDOW	Need to confirm process to create HUC layer from sites.					ATTRIBUTE1_huc12_nrcs_YellowMudTurtle_SP.shp	
Stream								
Focus Area	Various	Focus areas based on NCNA committee input	PhaseI_SouthPlatte_Focus_Segments_2010	Line	SWSI NCNA Phase I	Same as Phase 1?	PhaseI_SouthPlatte_Focus_Segments_2010	
Focus Area	Various	Focus areas in addition to stream channels.	PhaseI_SouthPlatte_Focus_Segments_2010_Polygons	Polygon	SWSI NCNA Phase I	Same as Phase 1?	N/A	
Focus Area							ParkCoFinalFocusSegments.shp	See BIPphaseIGISworkflow.pdf for more details
Focus Area							ApprovedReaches.shp	See BIPphaseIGISworkflow.pdf for more details
Focus Area							2014FocusAreasV3.shp	See BIPphaseIGISworkflow.pdf for more details
Projects			MetroSplatteBasin_All_Projects	Line	SWSI NCNA Phase II	All projects. Steve recommends we start with this, ignoring stewardship projects and merging linework on Project_ID.	MetroSplatteBasin_All_Projects	See BIPphaseIGISworkflow.pdf for more details
Projects & Studies			MetroSplatteBasin_All_Projects_Studies	Line	SWSI NCNA Phase II	All projects and studies. Steve recommends we start with this, ignoring stewardship projects and merging linework on Project_ID.	MetroSplatteBasin_All_Projects_Studies	See BIPphaseIGISworkflow.pdf for more details
Focus Areas joined to Projects			MetroSplatteBasin_Focus_Areas_Projects	Line	SWSI NCNA Phase II	All projects joined to focus areas.		
Focus Areas joined to Studies			MetroSplatteBasin_Focus_Areas_Studies	Line	SWSI NCNA Phase II	All studies joined to focus areas.		
Focus Areas joined to Projects and Studies			MetroSplatteBasin_Focus_Areas_Project_Studies	Line	SWSI NCNA Phase II	All projects and studies joined to focus areas.		
Base								

General Information (com	BIP Phase 2 New Data				BIP Phase 2 Stream Mile Representation				
Layer Group	Layer or Feature Class	Geometry Type	Source	Note	Layer or Feature Class Referenced to SWRF	Feature Class Attribute Name(s)	Geometry Type	Layer or Feature Class with Mile Markers to Export to Excel	Note
Attribute					ATTRIBUTE4_additional_wilderness_area_waters.shp	AddWilderness	Line		
Attribute					ATTRIBUTE2_Wood_Frog_SP.shp		Point		All point layers were not processed. All of their features were present in their reespective polygon layers.
Attribute					ATTRIBUTE2_huc12_nrcs_Wood_Frog_SP.shp	WoodFrog	Polygon		
Attribute					ATTRIBUTE1_YellowMudTurtle_SP.shp		Point		All point layers were not processed. All of their features were present in their reespective polygon layers.
Attribute					ATTRIBUTE1_huc12_nrcs_YellowMudTurtle_SP.shp	YMudTurtle	Polygon		
Stream	Div1_Strm_Mile_Model.gdb/ Model/ Strm_Route	Line	DWR - Chris Brown	This is the basis for the stream mile linework.		GNIS_NAME, GNIS_ID			
Focus Area						FA_ID, FA_NAME			
Focus Area						FA_ID, FA_NAME			
Focus Area									
Focus Area									
Focus Area	2014FocusAreasV3.shp	Line	BIP Phase I	See BIPphaseIGISworkflow.pdf for more details		COMID, Segment_No		FocusAreas_onSWRF_TenthMiles	See BIPphaseIIGIS_TechMemo.pdf for more details
Projects	MetroSplatteBasin_All_Projects	Line	SWSI NCNA Phase II geodatabase		N/A				This layer was not processed as all features were contained in MetroSplatteBasin_All_Projjects_Studies
Projects & Studies	MetroSplatteBasin_All_Projects_Studies	Line	SWSI NCNA Phase II geodatabase		MetroSplatteBasin_All_Projects_Studies	Project_ID	Line	FocusAreas_onSWRF_TenthMiles	Additional reference table is needed to display Project_ID: MetroSplatteBasin_All_ProjStud_IDreferenceTable
Focus Areas joined to Projects						P1_ID, P1_NAME			
Focus Areas joined to Studies						P1_ID, P1_NAME			
Focus Areas joined to Projects and Studies						P1_ID, P1_NAME			
Base									

Appendix D-4 - Stream Mile Representation Framework Stakeholder Data Input

South Platte Basin Implementation Plan Memorandum

TO: South Platte Basin and Metro Roundtables' Environmental and Recreational Subcommittee

REVIEWED BY: West Sage Water Consultants

FROM: Steve Malers (Open Water Foundation)

DATE: March 31, 2015

RE: Stream Mile Representation Framework Stakeholder Data Input

Introduction

This memorandum provides recommendations for how to incorporate stakeholder data in the Stream Mile Representation Framework (SMRF), which is used to present and analyze environmental and recreational (E&R) data. In this context, stakeholder is defined as any person or group that submits foundational data (e.g., E&R attributes from Colorado Parks and Wildlife) or supplemental data that increases the completeness of the analysis at a local scale (e.g., projects and methods for a local river reach).

The SMRF implemented for the South Platte Basin Implementation Plan (BIP) Phase II project is illustrated in Figure 1 below. The SMRF represents streams as .1-mile segments, with overlapping environmental and recreational (E&R) attributes, projects and methods, and other data. This approach allows a large amount of data to be spatially represented in Excel to .1-mile resolution, which allows E&R stakeholders to visualize data local to a stream reach of interest, and perform analysis.

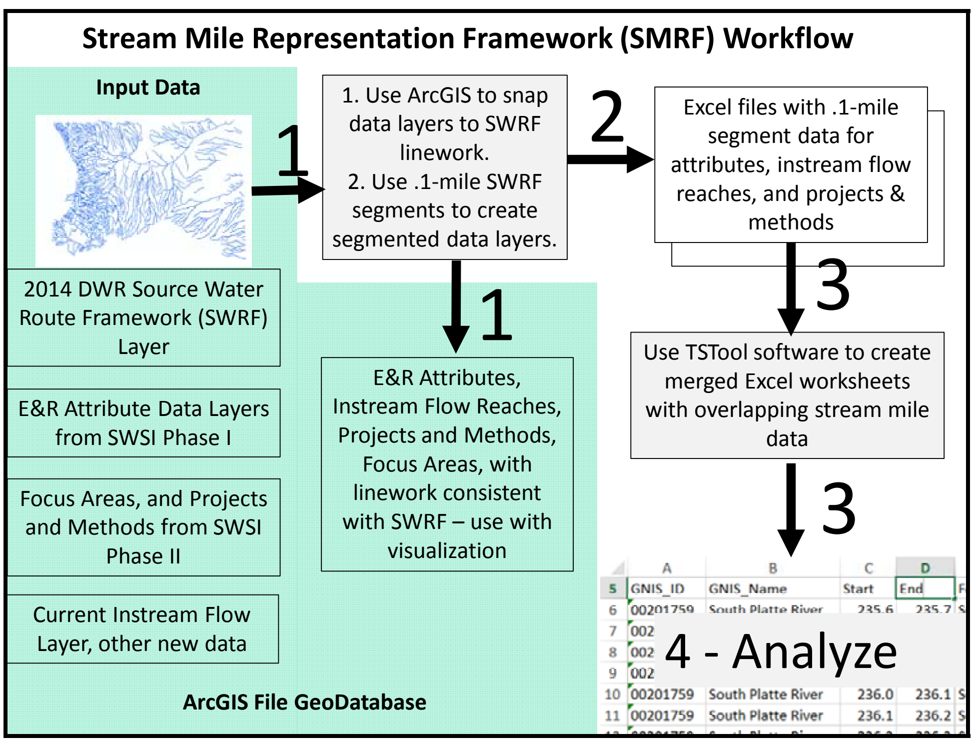


Figure 1. Stream Mile Representation Framework Workflow Overview

ArcGIS software is used to manage and process spatial data from multiple sources. Geographical Information System (GIS) processing for steps 1 and 2 in Figure 1 is described in the BIP memo "Stream Mile Representation GIS Workflow Processing," March, 2015. TSTool processing for step 3 in Figure 1 is described in the memorandum "Stream Mile Representation Framework TSTool Workflow Processing", March 2015. The result of the GIS and TSTool processes are an Excel workbook that includes E&R data, where rows represent .1-mile stream segments and columns are included for E&R attributes, instream flow reaches, projects and methods, locations of stream gages and diversion structures, and other data, as illustrated in Figure 2.

	A	B	C	D	E	F	G	H	I	J	L	O
1	GNIS_ID	GNIS_Name	GNIS_ID_FMEAS	FMEAS	TMEAS	Geographic	FocusArea	Type	Rationale	FocusAreaID	BaldEagle	BrassyMinnow
2	00178190	North Saint Vrain Creek	00178190_000.0	0.0	0.1	Northern	North Saint	Recreational	Whitewat	14	Yes	
3	00178190	North Saint Vrain Creek	00178190_000.1	0.1	0.2	Northern	North Saint	Recreational	Whitewat	14	Yes	
4	00178190	North Saint Vrain Creek	00178190_000.2	0.2	0.3	Northern	North Saint	Recreational	Whitewat	14	Yes	
5	00178190	North Saint Vrain Creek	00178190_000.3	0.3	0.4	Northern	North Saint	Recreational	Whitewat	14	Yes	
6	00178190	North Saint Vrain Creek	00178190_000.4	0.4	0.5	Northern	North Saint	Recreational	Whitewat	14	Yes	
7	00178190	North Saint Vrain Creek	00178190_000.5	0.5	0.6	Northern	North Saint	Recreational	Whitewat	14	Yes	
8	00178190	North Saint Vrain Creek	00178190_000.6	0.6	0.7	Northern	North Saint	Recreational	Whitewat	14	Yes	
9	00178190	North Saint Vrain Creek	00178190_000.7	0.7	0.8	Northern	North Saint	Recreational	Whitewat	14	Yes	
10	00178190	North Saint Vrain Creek	00178190_000.8	0.8	0.9	Northern	North Saint	Recreational	Whitewat	14	Yes	
11	00178190	North Saint Vrain Creek	00178190_000.9	0.9	1.0	Northern	North Saint	Recreational	Whitewat	14	Yes	
12	00178190	North Saint Vrain Creek	00178190_001.0	1.0	1.1	Northern	North Saint	Recreational	Whitewat	14	Yes	
13	00178190	North Saint Vrain Creek	00178190_001.1	1.1	1.2	Northern	North Saint	Recreational	Whitewat	14	Yes	
14	00178190	North Saint Vrain Creek	00178190_001.2	1.2	1.3	Northern	North Saint	Recreational	Whitewat	14	Yes	
15	00178190	North Saint Vrain Creek	00178190_001.3	1.3	1.4	Northern	North Saint	Recreational	Whitewat	14		

Figure 2. SMRF Excel workbook with integrated data for .1-mile segments

The South Platte Basin Roundtable Environmental and Recreational Subcommittee and an extended group of stakeholders has served as the primary source of E&R data for Statewide Water Supply Initiative (SWSI) and BIP projects. SWSI data were previously collected in an ad hoc manner through meetings, interviews, and specific data requests/submissions. However, the collected data has been relatively inaccessible to stakeholders, with limited download and no web data viewing.

The SMRF as implemented for the BIP does make use of an Esri ArcGIS file geodatabase to manage spatial data because this allows efficient processing of spatial data into the SMRF. However, many stakeholders do not have access to ArcGIS software or the skills to manipulate the geodatabase. This is one reason why the SMRF uses Excel as the final output – because most stakeholders do have access to Excel software and have the ability to use Excel for analysis.

There is a need to accept E&R data from stakeholders on an ongoing basis so that CWCB staff, contractors, and stakeholders themselves can utilize the data in E&R needs and gap analysis. The following approach describes options for managing such data submissions.

Approach

Stakeholder data that are useful in E&R data analysis include, but are not limited to the following:

- E&R attribute data (many layers have been collected through SWSI but others may be added)
- Spatial data sets maintained by a specific organization (e.g., wetlands inventory maintained by Colorado Natural Heritage Program, wildfire burn areas)
- Organizational extent (e.g., program area for a watershed conservation organization)

- Master plan extent (e.g., river reaches considered in stream restoration efforts of watershed coalition groups)
- Project extent (spatial extent of specific projects)
- Physical features useful for context (e.g., location of physical feature that is commonly used for reference on maps)

It is not efficient to manually digitize the above data, for example by marking up hardcopy maps of E&R focus areas. Instead, a protocol needs to be implemented to collect spatially-referenced data from stakeholders, even if they do not have ArcGIS capabilities. It is likely that a standard cannot be fully pushed onto stakeholders and their organizations; however, general guidelines can be implemented that will allow stakeholder data to be ingested into the SMRF analysis process, and such guidelines might eventually cause organizations to evolve their data standards.

Spatial Data

Before evaluating options for collecting data, it is useful to review the SMRF Excel workbook to understand how the data may be used. The Excel workbook represents streams by uniquely identifying a stream with its GNIS_ID (federal Geographic Names Information System) and the starting stream mile of the .1-mile segment (e.g., 00178190_000.1), which allows stream segments to be grouped and sorted. Consequently, at a minimum, the GNIS_ID and stream mile for spatial data need to be determined. One issue is that the stream mile that has been used in the SMRF is based on the Source Water Route Framework (SWRF) stream layer provided by the Colorado Division of Water Resources (see: http://cdss.state.co.us/GIS/Pages/AllGISData.aspx), and this layer may change over time, for example, when floods move rivers. Consequently the stream mile is not an absolute reference that will never change. For this reason, it is important that stakeholder-supplied data also be provided with geographic coordinates (or projected coordinates if data are provide in GIS formats such as shapefiles), so that the source data can be intersected with the SWRF layer after updates. It is recommended that stakeholder data should be provided with the following at a minimum:

- Geographic coordinates (or projected coordinates if in GIS format) for data endpoints on a stream reach, point data, or polygon data, as appropriate for the data type
- GNIS_ID of stream
- Start (and end) stream miles for the .1-mile segments that overlap supplied data, consistent with SMRF
- Identifier (see next section)
- Name

Ideally the information should be provided in an Excel file (or equivalent) with the above data clearly labeled in columns and/or named cell range. Additional information such as descriptions are also useful but will likely need to be evaluated on a case-by-case basis as improved data submission guidelines are developed over time.

A simple Google Maps prototype has been developed as part of the BIP project to facilitate determination of spatial data. Figure 3 illustrates a map for the Saint Vrain Basin and shows the SWRF linework for focus areas, and stream mile markers from the SMRF. A stakeholder can use such a tool as follows:

1. Visit the website. The current prototype is at the following URL but if a production tool is implemented in the future it will have different address: http://s3.amazonaws.com/owf-proj-bip/StreamMileFramework/Web-StakeholderDataEntry/SMRF-StakeholderDataEntry.html
2. Zoom in to a region appropriate for stakeholder data.
3. Click on a stream mile marker (circle) to display the GNIS_ID and stream mile for the location. This information can be provided with stakeholder-supplied data to spatially reference the data to the SMRF.
4. Double-click on the map at a specific point to display a popup box with latitude and longitude. This is a simple tool that can be made more sophisticated in the future. This information can also be provided with stakeholder data so that the raw coordinates can be used to recalculate stream mile if the SMRF data changes.

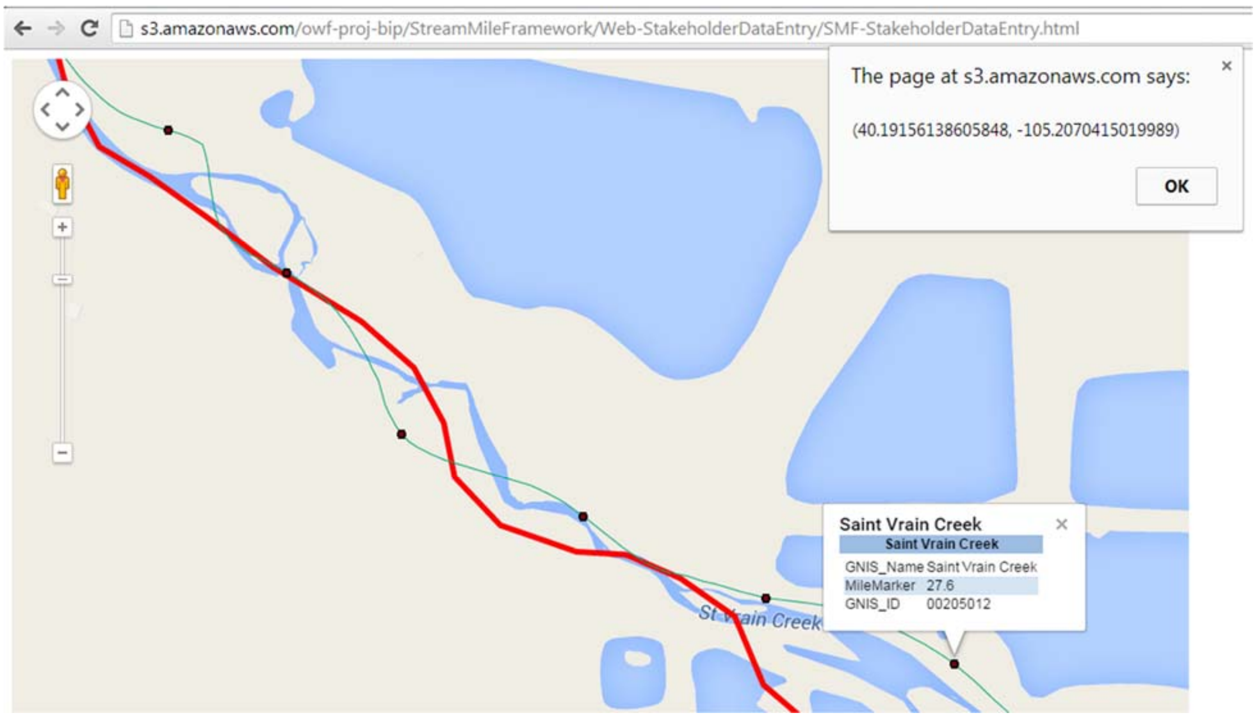


Figure 3. Simple prototype showing how stream mile data can be accessed for stakeholder data

An alternate approach to the above is to provide downloads for SMRF spatial data layers in GIS-friendly formats such as KML and shapefiles. KML files could then be used with Google Earth similar to the above example. One issue is that the latitude and longitude cannot be determined from Google Earth without first placing a marker on the map.

Open Data – Unique Identifiers

Ideally the stakeholder's E&R data being provided also will be publicly available on an organization's website. This allows transparency and simplifies the data flow from organizations to the State. Open data require that data resources can be uniquely identified. Unique identifiers are a guideline recommended by the Sunlight Foundation in its open data guidelines (see: http://sunlightfoundation.com/opendataguidelines).

Each E&R data resource needs a unique identifier that is human-readable. This is in addition to internal unique identifiers that may get assigned in the GIS or other data management system. The previous SWSI work assigned unique identifiers that in some cases had little meaning to stakeholders (e.g., project "803"). This coupled with limited metadata makes it difficult to track the data back to the original source. Therefore, it is recommended that unique identifiers be constructed using a protocol that has clear meaning. For example, identifiers could be formed using the organization and the organization's project identifier, such as "CPAW-2014-1234". The protocol that is used should be documented so that it has meaning from the stakeholder perspective for their data management and the State's perspective for its data management.

In the context of stakeholder-supplied data where the stakeholder does not utilize formal data management, it may be necessary to develop guidelines and provide a learning experience. More robust data management will evolve and data sharing will become easier over time.

In summary, stakeholder data should include some type of unique identifier that has meaning for their organization. This identifier should be used in the SMRF, potentially by adding additional information to the identifier, such as organization abbreviation. This will allow the data to be used in the SMRF and be tracked back to the original data provider. It will also allow stakeholder-supplied data to be accessed via the web should such capabilities be implemented.

Stakeholder Use of the SMRF

The Excel workbook resulting from the SMRF processing could be used directly by stakeholders. To do so:

1. Download the SMRF Excel workbook (location on the web is pending release of the final BIP products).
2. Create a new column in the worksheet for an area of interest. Label the column appropriately so as to not confuse with data from the SMRF.
3. Use existing data in the SMRF Excel worksheet to spatially locate segments that overlap the stakeholder data and/or use mapping tools such as discussed above.
4. Scroll to the appropriate stream mile row and enter information, for example the name of a data item or "Yes" to indicate that the item exists (if the heading clearly indicates the item).
5. Copy the value to as many rows as are appropriate.
6. Modify and/or add formulas to compute metrics or perform analysis. Ideally such analysis will be consistent with best practices identified by the E&R scientific community and leverage additional data.

Ideally stakeholder data that has value to others will be submitted to the State to enhance the core data in the SMRF, if data submission protocols are implemented and/or data are publicly available. In any case, stakeholders can independently use the SMRF tool to visualize and manage their own data.

Comments and Recommendations

The SMRF implemented for the South Platte BIP provides a framework that supports using stakeholder data such as environmental attributes, master plans, projects and methods, and other spatially-referenced data. Although this framework does require GIS and other processing to create data that are merged into the baseline SMRF Excel workbook, the concepts used in the SMRF, and the format of the Excel workbook are straightforward and encourage additional of stakeholder data. The following specific recommendations are made:

1. **Engage stakeholders to submit data and use the SMRF**. The SMRF prototype used existing SWSI E&R data, CWCB instream flow reaches, data layers from DWR, and other data to demonstrate the SMRF concept. However, additional data layers were identified that would help understand needs, challenges, and opportunities. For example, land use, land ownership, wetlands, organizational extent, master plan extent, and other spatial information could be included in the SMRF to enhance its value. The following actions are recommended:
    a. **Develop data submission standards**. This memorandum has highlighted several technical issues that need to be addressed to utilize stakeholder data in the SMRF. Additional effort is needed to more fully consider these and other issues to encourage efficient submission and use of stakeholder data.
    b. **Provide open access to SMRF data and products**. The input data for the SMRF consist primarily of openly available data layers. The products generated from the SMRF include map layers referenced to the State's SWRF layer, mile marker layer, and SMRF Excel workbook. All of these products should be openly provided on a website, with appropriate metadata and documentation.
    c. **Evaluate effectiveness of SMRF in addressing stakeholder needs**. Initial feedback on the SMRF approach and products has been positive. However, the true measure of usefulness will be whether stakeholders are able to access and use the tool as a platform for the work that they do. Effectiveness will likely require some level of involvement by the State to maintain the core tools, and an ability for stakeholders to combine their data with the Excel workbook. It is recommended that training and outreach with a key stakeholder group occur to evaluate the effectiveness of the SMRF. Such an effort should involve the Roundtable's Environmental and Recreational Subcommittee; however, working directly with various organizations such as The Nature Conservancy and watershed coalitions should also be pursued.
2. **Integrate local stakeholder data with larger analysis.** The overall SMRF analysis can be utilized to help the State evaluate E&R requirements, challenges, and opportunities to meeting those requirements. Local stakeholder data can contribute to the overall analysis, and regional/state programs can benefit local efforts by providing a platform of accessible data and tools. An integrated approach should be implemented in the next update of the Statewide Water Supply Initiative (SWSI).

Appendix D-5 - Instream Flow Protections in the South Platte Basin

South Platte Basin Implementation Plan Memorandum

TO:	South Platte Basin and Metro Roundtables' Environmental and Recreational Subcommittee
	West Sage Water Consultants
FROM:	Pete Conovitz (Colorado Parks and Wildlife)
DATE:	January 9, 2015
RE:	Instream Flow Protections in the South Platte Basin

Instream Flow Protections in the South Platte Basin.

The health of most if not all of the environmental and recreational (E&R) attributes identified within the South Platte Basin Implementation Plan are closely tied to streamflow. It is widely accepted that a river's flow regime, or the range and variability of streamflow over time (including both high and low flows), is critical to sustaining biodiversity and ecological integrity, and controls many physical and biological processes and characteristics of the river ecosystem. It is also widely understood that alterations in the flow regime results in changes that often negatively impact the river's ecological function, and by extension negatively impacting the E&R attributes it supports. Therefore, an effective strategy to preserve and enhance many E&R attributes should include actions designed to restore, maintain or enhance existing flow regimes within the South Platte River and its tributaries.

In Colorado, the primary mechanism to protect existing streamflow is through the Colorado Water Conservation Board's (CWCB) Instream flow (ISF) Program. In 1973, The CWCB was granted the exclusive authority to protect streamflow through a given reach of stream and has appropriated instream flow water rights on various rivers and streams throughout Colorado including those located within the South Platte Basin. More recently, The CWCB has also been authorized to improve the natural environment of a river system by adding water to streams or restoring native flows through acquisition or lease of water, water rights, or interests in water.

In order to appropriate an ISF water right, the CWCB must make three specific findings – that a natural environment exists, that a certain amount of water is needed to preserve that natural environment, and that water is available for the instream flow appropriation. To date, the CWCB has primarily relied upon the R2CROSS methodology to quantify instream flow requirements. The R2CROSS method models streamflow at a particular location and calculates key hydraulic parameters, such as wetted perimeter, depth and velocity, needed to maintain a minimum flow across a stream riffle (the shallowest and most critical low flow habitat type). Most ISF water rights in Colorado are based on the presence of a cold water fishery as an indicator of a functioning natural environment and it is assumed that if an adequate flow is maintained through the riffle habitat then the resulting flow will be sufficient to sustain fish and macro-invertebrates in all other parts of a stream reach. The CWCB primarily utilizes the R2CROSS method because it is cost effective, easy to use and produces consistent and reproducible results. It also has been upheld by the Colorado Water Courts as an accepted method for quantifying instream flow amounts. A limitation of the R2CROSS method is that it does not consider ecological components other than the hydraulics of a riffle and only yields a two stage flow recommendation (summer and winter). Therefore this method is associated with the protection of minimum flows. The CWCB is not limited to using the R2CROSS method exclusively to evaluate instream flow requirements and has the ability to utilize other quantification methods better suited for the protection of other riverine habitat types (pools, glides, side channels, etc.) and/or natural environment indicators other than cold water fisheries.

Regardless of the method, once the instream flow needs are quantified for a new appropriation the CWCB must determine whether water is physically and legally available to meet those needs. Like all water rights in Colorado, ISF water rights appropriated by the CWCB are subject to the prior appropriation system and are junior to existing decreed water rights, and therefore do not affect or injure existing uses on a given stream. Because of their junior priority, ISF rights are often limited by physical and legal water availability and are occasionally limited to stream reaches above existing diversions or are truncated at diversion structures that have historically dried up the stream thus causing a water availability limitation on the ISF water right.

The preservation of instream flows is critical for the future protection of environmental and recreational attributes whose health depends on streamflows. The CWCB ISF program has had 282 ISF water rights adjudicated in the South Platte and Republican Basins, representing over 1400 miles of protection. However, many environmental and recreation attributes identified in the South Platte BIP occur in transitional or low elevation stream environments where the majority of existing diversions occur. In these many of these areas a lack of water availability precludes a new ISF appropriation. Further, cold water fisheries which are the basis for most ISF appropriations are only one of many attributes identified in the BIP. Therefore, methodologies other than R2CROSS (as discussed above) and other ISF strategies (such as water leasing or acquisition to improve or restore flows) may be more productive in protecting and enhancing E&R attributes within the South Platte Basin. Multi-purpose storage projects with dedicated water for ISF maintenance or enhancement may also provide an effective tool for long term attribute protection.

Appendix D-6 - Review of South Platte Basin Master Plans

South Platte Basin Implementation Plan Memorandum

TO: South Platte Basin and Metro Roundtables' Environmental and Recreational Subcommittee

REVIEWED BY: West Sage Water Consultants

FROM: Katy Reagan (Sunbird Biological Consultants)

DATE: March 18, 2015

SUBJECT: Review of South Platte Basin Master Plans

Introduction

This memo summarizes available statewide, watershed, municipality, or regional planning documents pertinent to the South Platte Basin Implementation Plan (BIP). Planning documents were supplied by Environment and Recreation subcommittee members or the South Platte BIP contractor. In order to maintain consistency across the wide range of stakeholders and water related planning efforts in the South Platte Basin, a review of previously approved planning documents was completed. Documents were reviewed for relevancy to BIP goals, focus areas, and projects. Document review, including the document title, contact organization, year of publication, geographic coverage, source, summary, and plan outline are provided below for eighteen planning documents. The BIP content portion of the review indicates whether information from the planning document should be included in the BIP stream mile representation analysis (plan has specific location information), the BIP project list (plan has specific projects, project locations, and project sponsors), or if the information from the plan will be incorporated into an appendix of the BIP (no location or project specifics but plan and/or organization is acknowledged). An in-depth review was conducted on the following plans:

- Colorado Parks and Wildlife Statewide Strategies for Wetland and Riparian Conservation
- Coalition for the Upper South Platte Revised Watershed Plan
- Mosquito Range Heritage Initiative Strategic Plan
- St. Vrain Watershed Master Plan
- The River South Greenway Master Plan
- Big Thompson River Restoration Master Plan
- Poudre River Downtown Master Plan
- Upper Clear Creek Watershed Plan Update
- The Waldo Canyon Fire Master Plan for Watershed Restoration & Sediment Reduction
- The Trail Creek Watershed Master Plan for Stream Restoration & Sediment Reduction
- Chatfield Watershed Plan
- Cherry Creek Basin Water Quality Authority Watershed Plan 2012
- Bear Creek Watershed Plan
- The Lower Bear Creek Watershed Plan
- 2007 Clear Creek Watershed Report: Exploring Watershed Sustainability
- Boxelder Creek Regional Stormwater Master Plan
- Left Hand Creek Watershed Master Plan
- Big Thompson State of the Watershed 2010 Report

Plan Review

Statewide Strategies for Wetland and Riparian Conservation, Strategic Plan for the Wetland Wildlife Conservation Program	
BIP Content	Add to BIP Appendix. P2 directly relates to cooperation on water planning and BIP process, however no specific locations or projects are identified.
Contact	Terrestrial Habitat Conservation Program, Terrestrial Section, Wildlife Programs Branch, Colorado Parks and Wildlife
Year	July 2011, Version 2.0
Geographic Coverage	Colorado
Source	http://cpw.state.co.us/Documents/LandWater/WetlandsProgram/CDOWWetlandsProgramStrategicPlan110804.pdf

Summary

This plan is intended to describe the specific types of conservation plans to be implemented

- Location of those actions
- Scale of those actions
- Expected outcome of those actions for species' populations

Statewide goals to statewide strategies and tasks to support these broad goals

Due to lack of geospatial data and wetland assessments, it is not yet possible to characterize Colorado's wetland and riparian habitat resources at a statewide scale. This will be done systematically for smaller, basin-scale planning units as information becomes available. Specific conservation objectives (e.g.: specific habitat conservation goals and strategies) will be developed at this scale. It is expected stand-alone implementation plans will evolve for individual basins as additional planning tasks are completed and specific conservation objectives are developed.

Plan Outline

Spatial Planning Units: Program developed 10 major river basins in Colorado as planning units for wetland and riparian habitat conservation

Priority Wildlife Species: Priority wetland/riparian wildlife species include 1) waterfowl (primarily ducks) which provide valuable recreational opportunity for hunting and viewing; and 2) declining or at-risk species that are dependent on wetland or riparian areas during part or all of their life cycle

Plan goals

1) Improve the distribution and abundance of ducks, and opportunities for public waterfowl hunting
    a. Maintain or increase the quantity and quality of spring migration and duck breeding habitat, and duck breeding populations and production in breeding aeras important to Colorado

    Eastern plains are one of the geographic areas of emphasis for spring migration areas which include seasonal marshes and riparian zones with dynamic hydroperiods that support seed-producing annual plants and "pulses" of invertebrate production; habitats must be flooded during the migration period (managed flooding systems are often necessary); low human disturbance

    b. Improve the quantity and quality of fall migration and wintering habitat to attract and support increased duck numbers, particularly on public areas.

    Eastern plains (lower South Platte River corridor, lower Arkansas River corridor, Republican River corridor, eastern plains playas, Front Range reservoirs and streams) are one of the geographic areas of emphasis. Habitats include those listed above as well as sloughs and reservoirs that provide open water for roosting during winter.

c. Improve public access to waterfowl hunting in Colorado by increasing the number and diversity of public hunting opportunities.

This goal is statewide for all ducks in appropriate habitats for duck hunting.

2) Improve the status of declining or at-risk species associated with wetlands and riparian areas

Statewide Strategies and Tasks

- Biological Planning
- Conservation Design
- Habitat Delivery
- Monitoring
- Research
- Partnership
- Funding
- Granting
- Education and Outreach

Coalition for the Upper South Platte Revised Watershed Plan	
BIP Content	Add to BIP Appendix; no specific locations or projects are identified.
Contact	Coalition for the Upper South Platte
Year	2006?
Geographic Coverage	Upper South Platte; Strontia Springs Reservoir and reaches Continental Divide
Source	http://cusp.ws/ (report not found online)

Summary

Mission of the group is to protect the water quality and environmental health of the Upper South Platte Watershed, through the cooperative efforts of watershed stakeholders, with emphasis on community values and economic sustainability.

Plan Outline

Potential Contaminants

1. Sediment
2. Nutrients, particularly phosphorus
3. Metals/acid mine drainage
4. Microorganisms

Strategies for the Future

Organizational Values

Protection of ecological health and water quality

- The power of coalition
- Community
- Voluntary action
- Economic sustainability
- People are out most important resource

Driving Forces

Strategic Imperatives

Five Year Goals and Objectives

Five Year Watershed Work Plan

- High Priority Issues:

• Agriculture • Wildfire • Land Use and Development • Mining • Recreation • Transportation • Water Rights • Water Systems Operations • Invasive Species Low Priority Issues: • Natural pollution sources • Solid and hazardous waste • Stormwater runoff • Small scale mining operations • Spills/illegal dumping • Underground storage tanks • Wastewater treatment plants/septic systems Watershed protection, conservation, non-point source reduction and monitoring

Mosquito Range Heritage Initiative Strategic Plan	
BIP Content	Add to BIP Appendix. Specific reaches and potential funding sources for recreational and environmental projects are identified; however no specific project locations are provided.
Contact	Alma Foundation, Park County Community Development and Tourism, The Trust for Public Land
Year	June 2005
Geographic Coverage	North to south from Hoosier Pass to Weston Pass and east to west from the Middle Fork of the South Platte River to the Park County line
Source	http://www.mrhi.org/images/mrstrategicplan.pdf
Summary Vision and Goals- Stakeholders envision the conservation of unique natural areas, preservation of historic and cultural sites and structures, a diversity of recreation uses, and new community economic opportunities. Partner's intention to work toward creative solutions that benefit all stakeholders and both private and community interests.	
Plan Outline Planning Area Description • Cultural and Historic Legacy • Recreation Opportunities • Important Plants and Wildlife Stakeholder Involvement Vision and Goals • Cultural and Historic Resources • Recreation Resources • Natural Resources Existing Land Ownership • Pike National Forest	

• Bureau of Land Management • Alma State Wildlife Area • Stewardship Trust • Cemetery Loop Open Space • Fourteeners and other private lands Mapping Analysis- Setting Priorities Stream Corridors • Middle Fork of the South Platte River – Montgomery Reservoir to Wheeler Lake • Middle Fork of the South Platte River – Fairplay to Alma • Buckskin Creek • Sacramento Creek • Fourmile Creek and Southern Planning Areas Alpine Areas • Hoosier Pass • Mosquito Pass Road • Pennsylvania Mountain • Mount Sherman • Mount Bross, Lincoln, and Democrat Implementing the Plan Four Implementation Goals Cooperative Leadership Staff Coordinator Implementation on Multiple Fronts • Historic and cultural resource protection • Trail and greenway projects • Land conservation • Education and interpretation • Recreation • Heritage tourism • Water quality • Wildlife crossings and corridors Case Studies • Paris Mill • Town of Alma Riverwalk Trail • Mineral Belt National Recreational Trail

St. Vrain Watershed Master Plan	
BIP Content	Add to stream mile representation analysis and project list.
	Reach 1: confluence of St. Vrain Creek with Boulder Creek and ends at the eastern corporate limits of Longmont; Alternative 1- Split Channel, Alternative 2- Minor Stabilization
	Reach 2: begins at the eastern corporate limits of the City of Longmont and ends at Airport Road; two different alternatives evaluated but a formal alternative analysis was not completed, continued potential project evaluation continuing in this reach

	Reach 3: begins at Airport Road and ends at Highway 36 near Lyons; drainageway crossings, pond breaches, channel restoration
	Reach 4: begins at Highway 36, continuing upstream through Lyons along both South and North St. Vrain Creeks. North St. Vrain Creek for the upstream-most Apple Valley Bridge to the confluence, the South St. Vrain River from just upstream of the Andesite Quarry downstream to the confluence, and on the main stem of St. Vrain Creek from the confluence downstream through the Town of Lyons to Highway 36 Reach 4a- North St. Vrain, channel alignment Reach 4b- South St. Vrain, channel alignment Reach 4c- St. Vrain Creek, McConnell Ponds reconstruction
	Reach 5: runs along North St. Vrain Creek and begins at Apple Valley and ends at Buttonrock Reservoir; lateral channel migration and bank erosion, sediment deposition/aggradation, sediment erosion/degradation, debris blockage throughout reach and at drainage crossings, some damage to Highway 36 and Longmont Dam Road, and damage to drainageway crossings
	Reach 6: runs along South St. Vrain Creek and begins at the choke in the canyon (just upstream of Andesite Quarry) and ends at Riverside; bank erosion, sediment deposition/aggradation, sediment erosion/degradation, debris blockages throughout the reach and at drainageway crossings, some damage to Highway 7, and damage to drainageway crossings (3.5 miles upstream of the beginning of this reach); preservation of riparian areas
	Reach 7: South St. Vrain Creek begins upstream of Riverside and continues through Raymond to the upstream limit of the Planning Area; bank erosion, sediment deposition/aggradation, sediment erosion/degradation, debris blockage throughout the reach and at drainageway crossings, some damage to Riverside Drive, and damage to drainageway crossings
	The plan also provides a Potential Funding Matrix
Contact	The St. Vrain Creek Coalition
Year	November 25, 2014
Geographic Coverage	St. Vrain Creek Watershed including the following creeks: South St. Vrain Creek, Middle St. Vrain Creek, North St. Vrain Creek, and the main stem of St. Vrain Creek; St. Vrain watershed covers 546 square miles and 54 miles of creek; begins at the continental divide and ends at the start of the western edge of the plains
Source	http://tiny.cc/stvraincreek
Summary Purpose of the master plan is to identify actions that, if implemented, will lead to a more resilient creek corridor. The master plan focused on flood risk, ecological enhancements, and community values using best available science, expertise and public and diverse stakeholder input.	
Plan Outline Introduction Planning Objectives Planning Area Description Data Collection Data Development • Interviews with Coalition Members	

- Creek corridor evaluation and risk assessments
- Geomorphological assessments
- Flood risk assessments
- Supplemental flood hazard analysis

Unmet Needs/Recommendations

- Flood hazard modeling and mapping needs
- Recommendations for addressing flood hazard needs

Public Engagement Process
Alternative Development & Evaluation
Recommendations & Conceptual Design Strategies
Conceptual design strategies

- Incorporate/stabilize a low flow/bankfull channel section and floodplain bench

Site-specific considerations

- Bank protection
- Breach repairs
- Increasing in-stream habitat complexity
- Stream crossings

Reach 1: confluence of St. Vrain Creek with Boulder Creek and ends at the eastern corporate limits of Longmont
Reach 2: begins at the eastern corporate limits of the City of Longmont and ends at Airport Road
Reach 3: begins at Airport Road and ends at Highway 36 near Lyons
Reach 4: begins at Highway 36, continuing upstream through Lyons along both South and North St. Vrain Creeks. North St. Vrain Creek for the upstream-most Apple Valley Bridge to the confluence, the South St. Vrain River from just upstream of the Andesite Quarry downstream to the confluence, and on the main stem of St. Vrain Creek from the confluence downstream through the Town of Lyons to Highway 36
Reach 5: runs along North St. Vrain Creek and begins at Apple Valley and ends at Buttonrock Reservoir
Reach 6: runs along South St. Vrain Creek and begins at the choke in the canyon (just upstream of Andesite Quarry) and ends at Riverside
Reach 7: South St. Vrain Creek begins upstream of Riverside and continues through Raymond to the upstream limit of the Planning Area
Prioritization & Implementation
Prioritization and phasing of projects
Floodplain management
Permitting
Implementation

The River South Greenway Master Plan	
BIP Content	Southern Platte Valley Regional Park (W. Dartmouth Avenue (southern city limits) to W. Mississippi Avenue): create regional park that serves as an anchor for the South Platte Greenway, as well as a gateway into the City and County of Denver
	Commercial Greenway Corridor (W. Mississippi Avenue to S. Tejon Street): increase visual and physical connectivity between Vanderbilt Park, Johnson Habitat Park and the River and to lessen the visual and noise impacts caused by Santa Fe Drive and I-25

	Urban Greenway Corridor (S. Tejon Street to W. 13th Avenue): provide greater residential community focus on the River by improving access and connectivity between the River, Sun Valley residences and neighborhoods farther to the west
	Central Platte Valley Event District (W. 13th Avenue to 20th Street): extend the existing vitality and energy that characterizes Confluence Park to the north and south along the River
Contact	The Greenway Foundation
Year	January 18, 2010
Geographic Coverage	3.5 miles of the South Platte River within the River North Corridor
Source	http://www.greenwayfoundation.org/enhancements/pdf/riso.pdf

Summary

Establishes new vision for the reach of the River, also recommends guidelines for parks; recreational, environmental, and flood control enhancements; expanded public open space; aesthetic enhancements and improved water quality within the River's channel.

Plan Outline

Chapter 1: The River South Greenway Master Plan
Purpose and Mission of the Plan
Goals
The River South Greenway Vision

- Southern Platte Valley Regional Park: extends from the southern city limits to W. Mississippi Avenue
- Commercial Greenway Corridor: extends between W. Mississippi Avenue and S. Tejon Street
- Urban Greenway Corridor: located between S. Tejon Street and W. Colfax Avenue to the norrth
- Central Platte Valley Event District: extends between W. Colfax Avenue and 20th Street

Summary of Recommendations

- River health
- Transportation and roadways
- Public River edge
- Parks and public open space
- Multi-use trails and River connections
- In-River recreation
- Safety and security
- Implementation tools

Chapter 2: The Process
Acknowledgements
The Planning Process
Objectives

- Healthy
- Habitable
- Connected

Planning Principles
Next Steps
Chapter 3: Existing Conditions and Opportunities
River South Greenway Identity

Existing Land Use and Ownership Existing River Health Existing Water Quality Existing Riparian Habitat Existing Aquatic Habitat Existing Transportation and Roadways Existing Parks and Public Open Spaces Multi-Use Trails and River South Greenway Connections In-River Recreation River Safety and Security Opportunities Existing Conditions Maps Opportunities Maps Chapter 4: Detailed Recommendations River Health Transportation and Roadways Public River Edge Parks and Open Space Proposed Parks and Public Open Space Multi-use Trails and River Connections In-River Recreation Safety and Security Implementation Tools Summary of Recommended Projects

Big Thompson River Restoration Master Plan	
BIP Content	Add to BIP Appendix. No specific projects or locations identified in the plan.
Contact	Big Thompson River Restoration Coalition (BTRRC)
Year	September 23, 2014
Geographic Coverage	• Big Thompson River from Olympus Dam downstream to County Road 3 east of I-25 • North Fork of the Big Thompson River from the northern end of North Fork Road to the confluence with the main stem • Fish Creek from the western extents of Fox Creek Road to the confluence with the North Fork • West Creek from approximately 1/2 mile west of Devils Gulch Road along West Creek Road to the confluence with the North Fork, including approximately 1,000 feet of Devils Gulch
Source	http://bigthompsonriver.org/2014/10/13/full-draft-master-plan-for-the-big-thompson-river-restoration-coalition/
Summary Purpose of the plan is to guide stakeholders towards prioritization and implementation of stream rehabilitation projects that provide increased resiliency in our communities, economies, and river ecology. Objectives of the work include perform risk assessments and ecological improvement potential assessments; engage the various stakeholders throughout the master plan process; develop conceptual plans of proposed flood resiliency and restoration design treatments; and prioritize projects based on the assessments and approximate costs of each reach.	

<u>Plan Outline</u>

Poudre River Downtown Master Plan	
BIP Content	Add to stream mile representation analysis.
	Reach 1: Shields Street to Salyer Natural Area
	Reach 2: Lee Martinez Park to the Museum of Discovery
	Reach 3: Museum of Discover to BNSF Railroad
	Reach 4: BNSF Railroad to Linden Street
	Reach 5: Linden Street to Lincoln Avenue
	Reach 6: Lincoln Avenue to Mulberry Street
Contact	City of Fort Collins
Year	October 2014
Geographic Coverage	Cache la Poudre River downtown Fort Collins reach- section from Shields Street to Mulberry (nearly 3 miles)
Source	http://www.fcgov.com/poudre-downtown/pdf/final-plan.pdf

Summary

This plan integrates improvements to support many high-quality and safe recreational experiences, better protection against flood damage, and restored habitat connectivity for optimal river health and resiliency. The project is intended to design and facilitate a beautiful river corridor that provides recreation and flood mitigation, while also restoring and preserving vital habitat.

Plan Outline

Master Plan Overview

Project Mission

Stewardship-Experience-Sustainability-Education

Primary Objectives

Habitat

- Purchase land from willing sellers
- Conserve and restore the existing riparian ecosystem to promote rive health and resiliencey
- Deliver continuous, connected aquatic and riparian habitat for fish, wildlife, trees and plants
- Achieve and maintain diverse and sustainable native fish, wildlife and plant populations

Recreation

- As a guiding principle, trails will be located and designed with the goal of minimizing or eliminating negative impacts or damage to the environment.
- Provide a mix of active and passive recreational amenities both in and along the river which encourage a safe, healthy, outdoor lifestyle.
- Provide community gathering places and promote connectivity between recreational opportunities along the river corridor.

Flood Mitigation

- Improve public safety and protect properties from damaging floods.
- Eliminate 100-year flood overtopping of College Avenue and, if possible, eliminate the 100-year flow split along Vine Drive.
- Reconnect the river to its floodplain while maximizing the beneficial environmental and recreational uses of the river corridor.

Outreach and Engagement

Relationship to Other Planning Documents

Supporting Studies

Land Use Transitions

Character Zones Overview of the Poudre River Downtown Master Plan Master Plan by Reach Reach 1: Shields Street to Salyer Natural Area Reach 2: Lee Martinez Park to the Museum of Discovery Reach 3: Museum of Discover to BNSF Railroad Reach 4: BNSF Railroad to Linden Street Reach 5: Linden Street to Lincoln Avenue Reach 6: Lincoln Avenue to Mulberry Street Visual Glossy/Design Guidelines Project Formulation, Phasing and Costs Appendix

Upper Clear Creek Watershed Plan Update	
<u>BIP Content</u>	Add to stream mile representation analysis and project list. High Priority – Idaho Springs (HUC-0207) o Provide effective sediment control in Trail Creek, Hukill Gulch, Virginia Canyon, and o Spring Gulch o Control erosion, off-site sedimentation, and dust from the Frei Quarry o Implement CDOT SCAP Moderate-High Priority Clear Creek Headwaters (HUC-0102) o Conduct recommended study assessments and develop mitigation projects o Implement CDOT SCAP and USFS Watershed Restoration EA o Remove accumulated sediment from Georgetown Lake lagoon and forebay on South o Clear Creek o Install passive groundwater treatment system in Silver Plume Moderate-High Priority West Clear Creek (HUC-0103) o Conduct recommended study assessments and develop mitigation projects o Complete SCAP implementation for U.S. 40 Berthoud Pass East and Horseshoe Bend F o Mitigate and prevent future channel erosion from Berthoud Pass Ditch o Control sedimentation and non-point source pollution from mines in Lion Creek o Implement CDOT SCAP and USFS Watershed Restoration EA Moderate-High Priority North Clear Creek (HUC-0206) o Conduct recommended study assessments and develop mitigation projects o Control sediment impacts from Russell Gulch o Control sediment impacts from Frei Quarry on North Clear Creek o Steam habitat and brown trout fishery restoration o Implement remaining OU4 remedy All Moderate and Moderate-Low Impacted HUC Areas

	o Conduct recommended study assessments and develop mitigation projects o Complete mine drainage treatment and reclamation at Waldorf o Remove accumulated sediment from forebay on South Clear Creek o Control impacts from historic mining and implement mitigation BMPs in Soda Creek o Implement CDOT SCAP and USFS Watershed Restoration EA
Contact	Upper Clear Creek Watershed Association
Year	April 2014
Geographic Coverage	394 square mile drainage basin from the headwaters on the Continental Divide to the canyon mouth at the City of Golden
Source	Upper Clear Creek Water Association
Summary The plan enhances and updates the original 2006 Plan that provided a framework for the development of nonpoint source controls for key trace metals. This updated Plan expands the water quality variables beyond trace metals to provide a more comprehensive evaluation of water quality conditions in the watershed. This report uses new studies and reports since 2006 to define priority areas and potential projects that will result in overall water quality improvements in Clear Creek. This Watershed Plan update: 1) Summarizes Upper Clear Creek trace metal conditions since the previous 2006 plan 2) Expands the water quality constituent assessment to include sediment and nutrients 3) Summarizes recent studies and water quality planning documents 4) Details the current status of water quality in Clear Creek 5) Develops maps of priority areas and lists potential water quality improvement projects 6) Provides an updated Emergency Notification System list (ENS or "call down list")	
Plan Outline Introduction and Background Watershed Description Previous 2006 Watershed Plan for Trace Metals Recent Studies and Planning Documents Sediment, Nutrients and Metals Clear Creek Watershed Management Agreement Sediment and Associated Contaminants Storm Event Conditions Water Quality Status Summary Stakeholder Comments and Recommendations for Water Quality Improvement Watershed Priorities for Water Quality Improvement References	

The Waldo Canyon Fire Master Plan for Watershed Restoration & Sediment Reduction	
BIP Content	Add to BIP Appendix. No specific locations or projects are identified.
Contact	Coalition for the Upper South Platte (CUSP)
Year	April 26, 2013
Geographic Coverage	Waldo Canyon Fire area; 18,247 acres within the foothills and mountains of the Rampart Range immediately northwest of Colorado Springs in El Paso County

Source	http://cusp.ws/wp-content/uploads/2014/10/FinalWaldoCanyonFireMasterRestorationPlanComp.pdf

Summary
A post-fire Watershed Assessment for River Stability and Sediment Supply (WARSSS) was completed for the Waldo Canyon Fire area. The goal of the WARSSS and master restoration plan is to direct restoration efforts in a timely manner to those watersheds and processes that represent the highest significant risk for post-fire runoff and sediment yield and potential associated downstream damage.

Plan Outline

Introduction
Summary of the Waldo Canyon Fire WARSSS Study
Restoration Design Approach & Objectives
Restoration Goals and Objectives
Restoration Recommendations: Hillslope Processes
Restoration Treatment for Rills (Hand Work)
Restoration Treatment for Exposed Soil (Hand Work or Mechanical)
Restoration Treatment for Direct Sediment Routing (Hand Work or Mechanical)
Surface Erosion Summary
Restoration Treatments: Roads & Trails

- Relocate Roads that are within Drainageways
- Road Surface & Ditch-Line Erosion
- Drainage Structures
- Fill Erosion
- Headcut Channels Intercepted by Road
- Increase Maintenance Frequency
- ORV Roads & Trails
- Unauthorized Trails and Closed Roads
- Roads & Trail Summary

Restoration Concepts for Channel Processes

- Stream Type Succession
- Streambank Erosion
- Channel Incision & Headcuts

Stream Restoration Objectives
Restoration Concepts
Natural Channel Design (NCD) Methodology for Channel Processes
Design Decision Process
Typical Design Scenarios & Restoration Details for Channel Processes
Flow-Related Sediment
Design Scenario 1: D4 to C4 Stream Type Conversion
Design Scenario 2: F4 to B4c Stream Type Conversion
Design Scenario 3: G4 to B4 Stream Type Conversion
Design Scenario 4: C4 Poor to C4 Stable Conversion
Design Scenario 5: Tributary A4, F4b, or G4 to D4 Stream Type Conversion
Design Scenario 6: Tributary F4b to B4 Stream Type Conversion
Design Scenario 7: Tributary A4a+ or A4 Poor to A4a+ or A4 Stable Conversion
Design Scenario 8: Tributary A4a+ or A4 to B4a Stream Type Conversion
Recommendations for Hand Crew Treatments: Channel Processes

Summary of Proposed Sediment Reduction Due to Restoration Structures in Natural Channel Design Developing the Restoration Master Plan WARSSS Results Master Plan for Hillslope Processes Master Plan for Roads and Trails Master Plan for Channel Processes Summary of Sediment Reductions with the Master Plan Discussion & Summary References

The Trail Creek Watershed Master Plan for Stream Restoration & Sediment Reduction	
BIP Content	Add to BIP Appendix. No specific locations or projects are identified.
Contact	Coalition for the Upper South Platte
Year	April 22, 2011
Geographic Coverage	The Trail Creek Watershed involves nearly 16mi^2 of drainage area within the South Platte River drainage
Source	http://cusp.ws/wp-content/uploads/2014/10/TrailCreek_MasterPlanComp.pdf
Summary Developed for the Trail Creek Watershed to reduce the accelerated sediment yields following the Hayman Fire of 2002 based on the Watershed Assessment and River Stability and Sediment Supply (WARSSS). This plan documents the restoration objectives, priorities, various design scenarios for a diversity of sediment problems, structure designs, and earthwork computations for the various restoration scenarios.	
Plan Outline The Trail Creek Watershed Master Plan for Stream Restoration & Sediment Reduction Location & Description Sediment Sources by Process • Hillslope Processes • Channel Processes Restoration Design Approach, Assumptions & Objectives • Restoration Assumptions • Restoration Objectives Riparian Re-establishment Structures in Natural Channel Design Restoration Plan for Hillslope Processes Restoration Plan for Hydrologic Processes Restoration Plan for Channel Processes Typical Design Scenarios & Restoration Details for Channel Processes Typical Design Scenario 1: D4 to C4 Stream Type Conversion Typical Design Scenario 2: F4 to B4 Stream Type Conversion Typical Design Scenario 3: G4 to B4 Stream Type Conversion Typical Design Scenario 4: C4 Poor to C4 Stable Conversion Typical Design Scenario 5: Tributary F4b to D4 Conversion Typical Design Scenario 6: Tributary F4b to B4 Conversion Typical Design Scenario 7: Tributary A4a+ Poor to A4a+ Stable Typical Design Scenario 8: Tributary A4a+ to D4 Conversion	

Typical Design Scenario 9: Tributary A4a+ to B4a Conversion Summary of Sediment Reductions with the Master Plan Discussion & Summary Acknowledgements References

Chatfield Watershed Plan	
BIP Content	Add to BIP Appendix. No specific locations or projects are identified.
Contact	Chatfield Watershed Authority
Year	September 2014
Geographic Coverage	Chatfield Reservoir is 15 miles southwest of Denver, Colorado. The Chatfield Watershed (Watershed), spans parts of Jefferson, Douglas, and El Paso Counties and includes municipalities, towns and other populated areas such as Castle Rock, Castle Pines, Larkspur, Littleton, Louviers, Perry Park, Roxborough Park, and Sedalia.
Source	http://chatfieldwatershedauthority.org/wp-content/uploads/2013/07/Item-2-Chatfield-Watershed-Plan_09-10-14_redlined-Final-Draft.pdf
Summary Watershed conditions ultimately affect the Chatfield Reservoir which serves as a flood control, water supply, fishery and recreational waterbody. TP and chl-a are known pollutants of concern in the Chatfield Reservoir the Chatfield Watershed, water quality issues related to nutrients, sedimentation, and bacteria have been attributed to nonpoint sources including: • Stormwater runoff, • Erosion from degraded stream banks, • Runoff from wildfire burn areas, • Runoff from agricultural lands, and • Leachate from poorly functioning or unmaintained septic systems.	
Plan Outline Executive Summary 1. Watershed Goals and Objectives 2. Watershed Description 3. Regulatory and Agency Overview 4. Water Quality and Hydrologic Conditions 5. Pollutant Source Assessment and Linkage to Water Quality 6. Identification of Management Strategies 7. Implementation Program 8. References 9. Annotated Bibliography	

Cherry Creek Basin Water Quality Authority Watershed Plan 2012	
BIP Content	Add to BIP Appendix. No specific locations or projects are identified.
Contact	Cherry Creek Basin Water Quality Authority
Year	October 18, 2012
Geographic Coverage	Source of the Cherry Creek drainage is on the Palmer Divide, approximately 40 miles south of Cherry Creek Reservoir. The watershed is about 386mi2, located

	primarily in Douglas County with smaller portions in Arapahoe, Elbert, and El Paso Counties
Source	http://www.cherrycreekbasin.org/wp-content/uploads/2014/03/Watershed-Plan-2012.pdf
Summary The Watershed Plan is driven by the Authority's vision "water quality on Cherry Creek Reservoir and Watershed that optimizes beneficial uses for the public" and mission "protect beneficial uses by preserving, enhancing, and balancing water quality in Cherry Creek Reservoir and Cherry Creek Watershed.	
Plan Outline Chapter 1 covers the vision, mission, goals, and objectives • Understand watershed and reservoir • Preserve beneficial uses • Build projects. Implement programs. • Prevent and minimize negative water quality impacts • Invest resources wisely • Achieve numeric standard Chapter 2 reviews the watershed's history Chapter 3 summarizes Regulation 72 Chapter 4 evaluates existing and projected conditions in the watershed Chapter 5 proposes potential management strategies Potential Pollutant Sources: agricultural operations, animal wastes, goose droppings, individual sewage disposal systems, point sources-wastewater treatment plants, stormwater- regulated, water development implications, stream erosion, point sources- other discharges Chapter 6 considers funding issues Chapter 7 describes priorities and an implementation strategy A Bibliography & Acronyms are found at the end	

Bear Creek Watershed Plan	
BIP Content	Add to BIP Appendix. No specific locations or projects are identified.
Contact	Bear Creek Watershed Association
Year	Updated regularly
Geographic Coverage	Bear Creek watershed
Source	http://www.bearcreekwatershed.org/Watershed%20Plan.htm
Summary Bear Creek Watershed Plan is comprised of multiple documents maintained electronically (BCWA Policy 28). This Watershed Plan is being continually updated to add links to all BCWA documents as maintained in a new Master Index List. Master Index List (MIL) is listing of Program Documents that Comprise many of the Elements of the BCWA Watershed Plan - BCWA Policies, Maps, Fact Sheets, Technical Memorandum, Informational Sheets, Standard Review Papers, Rulemaking Hearing Statements, Primary Program Spreadsheets, Annual Reports, and Data Reports. It will also contain links to other sites, other PDF documents and references.	
Plan Outline Chapter 1- Watershed & Regulatory Framework Watershed Approach to Manage Water Resources History and Background Bear Creek Watershed Features	

The Lower Bear Creek Watershed Plan	
BIP Content	Add to BIP Appendix. No specific locations or projects are identified.
Contact	Groundwork Denver
Year	Plan is under development
Geographic Coverage	Bear Creek is a major tributary of the South Platte River that flows from its headwaters on Mount Evans about 42 miles until it meets the South Platte in Sheridan.
Source	http://groundworkcolorado.org/projects/bear-creek-watershed/
Summary Bear Creek offers a great recreational resource to neighborhoods throughout the Denver-metro area, with extensive parks, natural areas and a paved multi-use path. Unfortunately, Lower Bear Creek is considered "impaired" for recreational use due to E. coli contamination. It is also threatened by trash, oil and grease, and nutrient pollution.	
Plan Outline A watershed plan for Lower Bear Creek was financially and technically supported by the Water Quality Control Division at the Colorado Department of Public Health and Environment. With the assistance of the National Park Service RTCA, Groundwork Denver facilitated a steering committee of stakeholders to guide the watershed planning effort from 2012 to 2014. Our work includes water quality and watershed data collection, stakeholder engagement through volunteerism, and community outreach and education. The watershed plan will be available online upon approval by the Colorado Department of Public Health and Environment.	

2007 Clear Creek Watershed Report: Exploring Watershed Sustainability	
BIP Content	Add to BIP Appendix. No specific locations or projects are identified.
Contact	Clear Creek Watershed Foundation
Year	November 19, 2007
Geographic Coverage	Clear Creek Watershed west of Denver, 575mi^2 from mountain peaks at its western edge on the Continental Divide down to the urbanized plains at its confluence with the South Platte River just north of Denver
Source	http://www.clearcreekwater.org/pdfs/CCWF-2007-report-optimized.pdf
Summary Documents and examines general watershed conditions and sustainable watershed management techniques that have been applied to the Clear Creek Watershed. The document is both a roadmap for the way forward and an example of real world techniques that might be applied by other watersheds throughout the arid mountain west. Our underlying thesis is: If cleaner water is good, there must be a viable market in producing sustainable results.	
Plan Outline Executive Summary Key Definitions Purpose of Report Introduction Water Quality and Water Quantity in the Clear Creek Watershed: An Overview Ecological Perspective Societal Perspective Economic Perspective Utilizing A Valuation Technique to Assess the Triple Bottom Line Value of Projects	

Applying Sustainable Watershed Management to the Clear Creek Watershed Major Findings

Boxelder Creek Regional Stormwater Master Plan	
BIP Content	Add to BIP Appendix. No specific locations or projects are identified.
Contact	Boxelder Stormwater Authority, Larimer County, Boxelder Creek Regional Alliance
Year	October 2006
Geographic Coverage	Boxelder Creek Watershed represents a vast, relatively undeveloped part of northeastern Larimer County. The drainage basins in this watershed cover approximately 260mi^2 and extend from southeast Fort Collins north into Wyoming. The Boxelder Creek Watershed includes the entire Town of Wellington, a portion of the City of Fort Collins, and areas adjacent to the towns of Windsor and Timnath.
Source	https://larimer.org/engineering/stormwater/boxelder/History_Master_Plan.htm http://www.boxelderauthority.org/news.php?category=5

Summary

The Master Plan for Boxelder Creek Regional Stormwater initially outlined several different approaches in addressing the flooding issues throughout the lower portions of the Boxelder Creek Basin. In a comparative analysis, the design detail and estimated costs of all the alternatives were limited since in-depth analyses of each alternative would make an all-encompassing Master Plan cost-prohibitive. Based on this limitation, the approved Master Plan included the proposal of a three-phase approach of identifying the needed improvements with the realization that modifications were likely to occur as projects were implemented and closely evaluated.

Plan Outline

Boxelder Watershed Area
Historical Flooding
Need for Improvements
Addressing the Need
Boxelder Stormwater master Plan Elements
Phase I Improvements (1-5 years)

1. Coal Creek Flood Mitigation Project
2. Edson Stormwater Detention Facility/ Edson Reservoir
3. Middle Boxelder Creek Stream Improvements/ Middle Basin Improvements

Phase II Improvements (3-8 years)
These improvements are not a part of the Stormwater Authority projects:

- Construction of a siphon structure along the Larimer and Weld Canal at Boxelder Creek to reduce overtopping;
- Construction of an I-25 Split Flow Diversion Channel that would protect CR 42E and remove approximately 300 additional acres from the floodplain;
- Improvements to Prospect Rd west of I-25;
- Construction of a spillway structure on Boxelder Creek and a channel to the Cache la Poudre River.

Phase III Improvements (5-15 years)
These improvements are not a part of the Stormwater Authority projects

- Middle Boxelder Creek road crossing improvements; and

• Cooper Slough/Mulberry Street and Lake Canal improvements Implementation Timing of Improvements

Left Hand Creek Watershed Master Plan	
BIP Content	Add to BIP Appendix. Specific reaches identified but no specific projects are identified.
Contact	Left Hand Creek Master Plan Coalition
Year	December 9, 2014
Geographic Coverage	The Planning Area for the LHCWMP was the geographic area for data collection, analysis, and all other planning activities. The Planning Area was defined in the following manner: • Left Hand Creek from its headwaters near the base of Niwot Ridge, to its confluence with James Creek; • James Creek from its headwaters near the Town of Ward (including Little James Creek east of the Sky Ranch Estates subdivision), to above the confluence with Left Hand Creek; • The main stem of Left Hand Creek below the James Creek confluence, to its confluence with St. Vrain Creek in the City of Longmont; and • That portion of the South St. Vrain Creek Watershed above the trans-basin diversion in R73W T2N Sec 36. On the plains, neither the Dry Creek north of Left Hand Creek, nor the Dry Creek south of Left Hand Creek were included in the Planning Area.
Source	http://lwog.org/resources/reports/Lefthand%20Watershed%20Plan.pdf
Summary The Left Hand Creek Watershed Master Plan (LHCWMP) was written to address and coordinate the response to key restoration issues in the planning area in the aftermath of the September 2013 floods along the Colorado Front Range.	
Plan Outline Executive Summary Introduction Planning Process Watershed Background and Description Risk Assessment Project Recommendations Next Steps	

Big Thompson State of the Watershed 2010 Report	
BIP Content	Add to BIP Appendix. No specific locations and no specific projects are identified.
Contact	Big Thompson Watershed Forum
Year	Feb 4, 2011
Geographic Coverage	Big Thompson watershed is located approximately 50 miles northwest of Denver, covering more than 900 mi^2 east of the Continental Divide
Source	http://www.coloradowater.org/documents/BTWF%20State%20of%20Watershed%20Report_Final.pdf

<u>Summary</u> Report presents current State of the Watershed for rivers, streams, and canals in the Big Thompson watershed. The report supports the Forum's efforts to identify and evaluate strategies for watershed management and protection in the process of maintaining a comprehensive watershed management plan.
<u>Plan Outline</u> Executive Summary 1 Introduction and Background 2 Dataset and Data Treatment 3 Data Analysis 4 Findings and Recommendations 5 References

Appendix D-7 – EXCEL Output of SMRF for Example Areas

South Platte Basin Implementation Plan Output

The printouts show a small portion of each example area from the Stream Mile Representation Framework output. Additional information is available from the spreadsheet available at:

SouthPlatteBasin.com

South Platte Basin Implementation Plan Output

Stream Mile Representation Framework Output for St. Vrain Creek at Lyons.

GNIS_ID	GNIS_Name	GNIS_ID_FMEAS	FMEAS	TMEAS	Geographic	FocusArea	Type	Rationale	FocusAreaID	BaldEagle
00178190	North Saint Vrain Creek	00178190_000.0	0.0	0.1	Northern	North Saint Vrain Creek H	Recreational	Whitewater Boating Fishing	14	Yes
00178190	North Saint Vrain Creek	00178190_000.1	0.1	0.2	Northern	North Saint Vrain Creek H	Recreational	Whitewater Boating Fishing	14	Yes
00178190	North Saint Vrain Creek	00178190_000.2	0.2	0.3	Northern	North Saint Vrain Creek H	Recreational	Whitewater Boating Fishing	14	Yes
00178190	North Saint Vrain Creek	00178190_000.3	0.3	0.4	Northern	North Saint Vrain Creek H	Recreational	Whitewater Boating Fishing	14	Yes
00178190	North Saint Vrain Creek	00178190_000.4	0.4	0.5	Northern	North Saint Vrain Creek H	Recreational	Whitewater Boating Fishing	14	Yes
00178190	North Saint Vrain Creek	00178190_000.5	0.5	0.6	Northern	North Saint Vrain Creek H	Recreational	Whitewater Boating Fishing	14	Yes
00178190	North Saint Vrain Creek	00178190_000.6	0.6	0.7	Northern	North Saint Vrain Creek H	Recreational	Whitewater Boating Fishing	14	Yes
00178190	North Saint Vrain Creek	00178190_000.7	0.7	0.8	Northern	North Saint Vrain Creek H	Recreational	Whitewater Boating Fishing	14	Yes
00178190	North Saint Vrain Creek	00178190_000.8	0.8	0.9	Northern	North Saint Vrain Creek H	Recreational	Whitewater Boating Fishing	14	Yes
00178246	South Saint Vrain Creek	00178246_000.0	0.0	0.1	Northern	North Saint Vrain Creek H	Recreational	Whitewater Boating Fishing	14	Yes
00178246	South Saint Vrain Creek	00178246_000.1	0.1	0.2	Northern	North Saint Vrain Creek H	Recreational	Whitewater Boating Fishing	14	Yes
00178246	South Saint Vrain Creek	00178246_000.2	0.2	0.3	Northern	North Saint Vrain Creek H	Recreational	Whitewater Boating Fishing	14	Yes
00178246	South Saint Vrain Creek	00178246_000.3	0.3	0.4	Northern	North Saint Vrain Creek H	Recreational	Whitewater Boating Fishing	14	Yes
00178246	South Saint Vrain Creek	00178246_000.4	0.4	0.5	Northern	North Saint Vrain Creek H	Recreational	Whitewater Boating Fishing	14	Yes
00178246	South Saint Vrain Creek	00178246_000.5	0.5	0.6	Northern	North Saint Vrain Creek H	Recreational	Whitewater Boating Fishing	14	
00178246	South Saint Vrain Creek	00178246_000.6	0.6	0.7	Northern	North Saint Vrain Creek H	Recreational	Whitewater Boating Fishing	14	
00178246	South Saint Vrain Creek	00178246_000.7	0.7	0.8	Northern	North Saint Vrain Creek H	Recreational	Whitewater Boating Fishing	14	
00178246	South Saint Vrain Creek	00178246_000.8	0.8	0.9	Northern	North Saint Vrain Creek H	Recreational	Whitewater Boating Fishing	14	
00205012	Saint Vrain Creek	00205012_031.4	31.4	31.5	Northern	North Saint Vrain Creek H	Recreational	Whitewater Boating Fishing	14	
00205012	Saint Vrain Creek	00205012_031.5	31.5	31.6	Northern	North Saint Vrain Creek H	Recreational	Whitewater Boating Fishing	14	
00205012	Saint Vrain Creek	00205012_031.6	31.6	31.7	Northern	North Saint Vrain Creek H	Recreational	Whitewater Boating Fishing	14	
00205012	Saint Vrain Creek	00205012_031.7	31.7	31.8	Northern	North Saint Vrain Creek H	Recreational	Whitewater Boating Fishing	14	
00205012	Saint Vrain Creek	00205012_031.8	31.8	31.9	Northern	North Saint Vrain Creek H	Recreational	Whitewater Boating Fishing	14	Yes
00205012	Saint Vrain Creek	00205012_031.9	31.9	32.0	Northern	North Saint Vrain Creek H	Recreational	Whitewater Boating Fishing	14	Yes
00205012	Saint Vrain Creek	00205012_032.0	32.0	32.1	Northern	North Saint Vrain Creek H	Recreational	Whitewater Boating Fishing	14	Yes
00205012	Saint Vrain Creek	00205012_032.1	32.1	32.2	Northern	North Saint Vrain Creek H	Recreational	Whitewater Boating Fishing	14	Yes
00205012	Saint Vrain Creek	00205012_032.2	32.2	32.2	Northern	North Saint Vrain Creek H	Recreational	Whitewater Boating Fishing	14	Yes

GNIS_ID	GNIS_Name	GNIS_ID_FMEAS	BrassyMinnow	ComGarterSnake	ComShiner	InstreamFlow	IowaDarter	KayakWhitewater	LakeChubStream	NLeopFrog
00178190	North Saint Vrain Creek	00178190_000.0				Yes		Yes		Yes
00178190	North Saint Vrain Creek	00178190_000.1				Yes		Yes		Yes
00178190	North Saint Vrain Creek	00178190_000.2				Yes		Yes		Yes
00178190	North Saint Vrain Creek	00178190_000.3				Yes		Yes		Yes
00178190	North Saint Vrain Creek	00178190_000.4				Yes		Yes		Yes
00178190	North Saint Vrain Creek	00178190_000.5				Yes		Yes		Yes
00178190	North Saint Vrain Creek	00178190_000.6				Yes		Yes		Yes
00178190	North Saint Vrain Creek	00178190_000.7				Yes		Yes		Yes
00178190	North Saint Vrain Creek	00178190_000.8				Yes		Yes		Yes
00178246	South Saint Vrain Creek	00178246_000.0				Yes				
00178246	South Saint Vrain Creek	00178246_000.1				Yes				
00178246	South Saint Vrain Creek	00178246_000.2				Yes				
00178246	South Saint Vrain Creek	00178246_000.3				Yes				
00178246	South Saint Vrain Creek	00178246_000.4				Yes				
00178246	South Saint Vrain Creek	00178246_000.5				Yes				
00178246	South Saint Vrain Creek	00178246_000.6				Yes				
00178246	South Saint Vrain Creek	00178246_000.7				Yes				
00178246	South Saint Vrain Creek	00178246_000.8				Yes				
00205012	Saint Vrain Creek	00205012_031.4	Yes	Yes	Yes		Yes		Yes	Yes
00205012	Saint Vrain Creek	00205012_031.5	Yes	Yes	Yes		Yes		Yes	Yes
00205012	Saint Vrain Creek	00205012_031.6	Yes	Yes	Yes		Yes		Yes	Yes
00205012	Saint Vrain Creek	00205012_031.7	Yes	Yes	Yes		Yes		Yes	Yes
00205012	Saint Vrain Creek	00205012_031.8	Yes	Yes	Yes		Yes		Yes	Yes
00205012	Saint Vrain Creek	00205012_031.9	Yes	Yes	Yes		Yes		Yes	Yes
00205012	Saint Vrain Creek	00205012_032.0	Yes	Yes	Yes		Yes		Yes	Yes
00205012	Saint Vrain Creek	00205012_032.1	Yes	Yes	Yes		Yes		Yes	Yes
00205012	Saint Vrain Creek	00205012_032.2	Yes	Yes	Yes		Yes		Yes	Yes

GNIS_ID	GNIS_Name	GNIS_ID_FMEAS	NRedbellyDace	OccPrebMouse	OvrPrebMouse	RaftWhitewater	RivOtterSight	SigPlants	Stonecat	StreamFishing	WoodFrog
00178190	North Saint Vrain Creek	00178190_000.0			Yes	Yes	Yes	Yes		Yes	Yes
00178190	North Saint Vrain Creek	00178190_000.1			Yes	Yes		Yes		Yes	Yes
00178190	North Saint Vrain Creek	00178190_000.2			Yes	Yes		Yes		Yes	Yes
00178190	North Saint Vrain Creek	00178190_000.3			Yes	Yes		Yes		Yes	Yes
00178190	North Saint Vrain Creek	00178190_000.4			Yes	Yes		Yes		Yes	Yes
00178190	North Saint Vrain Creek	00178190_000.5			Yes	Yes		Yes		Yes	Yes
00178190	North Saint Vrain Creek	00178190_000.6			Yes	Yes		Yes		Yes	Yes
00178190	North Saint Vrain Creek	00178190_000.7			Yes	Yes		Yes		Yes	Yes
00178190	North Saint Vrain Creek	00178190_000.8			Yes	Yes		Yes		Yes	Yes
00178246	South Saint Vrain Creek	00178246_000.0			Yes		Yes			Yes	
00178246	South Saint Vrain Creek	00178246_000.1			Yes		Yes			Yes	
00178246	South Saint Vrain Creek	00178246_000.2			Yes		Yes			Yes	
00178246	South Saint Vrain Creek	00178246_000.3			Yes		Yes			Yes	
00178246	South Saint Vrain Creek	00178246_000.4			Yes		Yes			Yes	
00178246	South Saint Vrain Creek	00178246_000.5			Yes		Yes			Yes	
00178246	South Saint Vrain Creek	00178246_000.6			Yes		Yes			Yes	
00178246	South Saint Vrain Creek	00178246_000.7			Yes		Yes			Yes	
00178246	South Saint Vrain Creek	00178246_000.8			Yes		Yes			Yes	
00205012	Saint Vrain Creek	00205012_031.4	Yes	Yes	Yes				Yes	Yes	
00205012	Saint Vrain Creek	00205012_031.5	Yes	Yes	Yes				Yes	Yes	
00205012	Saint Vrain Creek	00205012_031.6	Yes	Yes	Yes				Yes	Yes	
00205012	Saint Vrain Creek	00205012_031.7	Yes	Yes	Yes				Yes	Yes	
00205012	Saint Vrain Creek	00205012_031.8	Yes	Yes	Yes				Yes	Yes	
00205012	Saint Vrain Creek	00205012_031.9	Yes	Yes	Yes				Yes	Yes	
00205012	Saint Vrain Creek	00205012_032.0	Yes	Yes	Yes				Yes	Yes	
00205012	Saint Vrain Creek	00205012_032.1	Yes	Yes	Yes				Yes	Yes	
00205012	Saint Vrain Creek	00205012_032.2	Yes	Yes	Yes		Yes		Yes	Yes	

GNIS_ID	GNIS_Name	GNIS_ID_FMEAS	Segment_No	I	ISF_3	ISF_4	ISF_5	ISF_ID	Basin	I	PRJ_4	PRJ_5	PRJ_8	ProjectID	SGHist_usgss
00178190	North Saint Vrain Creek	00178190_000.0	14			1-87CW282		1-87CW282	South Platte		1-87CW282		803	803,1-87C	
00178190	North Saint Vrain Creek	00178190_000.1	14			1-87CW282		1-87CW282	South Platte		1-87CW282		803	803,1-87C	
00178190	North Saint Vrain Creek	00178190_000.2	14			1-87CW282		1-87CW282	South Platte		1-87CW282		803	803,1-87C	
00178190	North Saint Vrain Creek	00178190_000.3	14			1-87CW282		1-87CW282	South Platte		1-87CW282		803	803,1-87C	
00178190	North Saint Vrain Creek	00178190_000.4	14			1-87CW282		1-87CW282	South Platte		1-87CW282		803	803,1-87C	
00178190	North Saint Vrain Creek	00178190_000.5	14			1-87CW282		1-87CW282	South Platte		1-87CW282		803	803,1-87C	
00178190	North Saint Vrain Creek	00178190_000.6	14			1-87CW282		1-87CW282	South Platte		1-87CW282		803	803,1-87C	
00178190	North Saint Vrain Creek	00178190_000.7	14			1-87CW282		1-87CW282	South Platte		1-87CW282		803	803,1-87C	
00178190	North Saint Vrain Creek	00178190_000.8	14			1-87CW282		1-87CW282	South Platte		1-87CW282		803	803,1-87C	
00178246	South Saint Vrain Creek	00178246_000.0	14				1-87CW283	1-87CW283	South Platte			1-87CW283	803	803,1-87C	
00178246	South Saint Vrain Creek	00178246_000.1	14				1-87CW283	1-87CW283	South Platte			1-87CW283	803	803,1-87C	
00178246	South Saint Vrain Creek	00178246_000.2	14				1-87CW283	1-87CW283	South Platte			1-87CW283	803	803,1-87C	
00178246	South Saint Vrain Creek	00178246_000.3	14				1-87CW283	1-87CW283	South Platte			1-87CW283	803	803,1-87C	
00178246	South Saint Vrain Creek	00178246_000.4	14				1-87CW283	1-87CW283	South Platte			1-87CW283	803	803,1-87C	
00178246	South Saint Vrain Creek	00178246_000.5	14				1-87CW283	1-87CW283	South Platte			1-87CW283	803	803,1-87C	
00178246	South Saint Vrain Creek	00178246_000.6	14				1-87CW283	1-87CW283	South Platte			1-87CW283	803	803,1-87C	
00178246	South Saint Vrain Creek	00178246_000.7	14		1-87CW278		1-87CW283	1-87CW283,	South Platte			1-87CW283	803	803,1-87C	
00178246	South Saint Vrain Creek	00178246_000.8	14		1-87CW278			1-87CW278	South Platte			1-87CW283	803	803,1-87C	
00205012	Saint Vrain Creek	00205012_031.4	14						South Platte				803	803,803	
00205012	Saint Vrain Creek	00205012_031.5	14						South Platte				803	803	
00205012	Saint Vrain Creek	00205012_031.6	14						South Platte				803	803	
00205012	Saint Vrain Creek	00205012_031.7	14						South Platte				803	803,803	
00205012	Saint Vrain Creek	00205012_031.8	14						South Platte				803	803	06724000
00205012	Saint Vrain Creek	00205012_031.9	14						South Platte				803	803,803	
00205012	Saint Vrain Creek	00205012_032.0	14						South Platte				803	803	
00205012	Saint Vrain Creek	00205012_032.1	14						South Platte				803	803	
00205012	Saint Vrain Creek	00205012_032.2	14						South Platte				803	803	

GNIS_ID	GNIS_Name	GNIS_ID_FMEAS	SGHist_dwra	SGHist_statname	SGHist_meas_act	SGReal_usgsstatid	SGReal_dwrabbrev
00178190	North Saint Vrain Creek	00178190_000.0					
00178190	North Saint Vrain Creek	00178190_000.1					
00178190	North Saint Vrain Creek	00178190_000.2					
00178190	North Saint Vrain Creek	00178190_000.3					
00178190	North Saint Vrain Creek	00178190_000.4					
00178190	North Saint Vrain Creek	00178190_000.5					
00178190	North Saint Vrain Creek	00178190_000.6					
00178190	North Saint Vrain Creek	00178190_000.7					
00178190	North Saint Vrain Creek	00178190_000.8					
00178246	South Saint Vrain Creek	00178246_000.0					
00178246	South Saint Vrain Creek	00178246_000.1					
00178246	South Saint Vrain Creek	00178246_000.2					
00178246	South Saint Vrain Creek	00178246_000.3					
00178246	South Saint Vrain Creek	00178246_000.4					
00178246	South Saint Vrain Creek	00178246_000.5					
00178246	South Saint Vrain Creek	00178246_000.6					
00178246	South Saint Vrain Creek	00178246_000.7					
00178246	South Saint Vrain Creek	00178246_000.8					
00205012	Saint Vrain Creek	00205012_031.4					
00205012	Saint Vrain Creek	00205012_031.5					
00205012	Saint Vrain Creek	00205012_031.6					
00205012	Saint Vrain Creek	00205012_031.7					
00205012	Saint Vrain Creek	00205012_031.8	SVCLYOCO	ST. VRAIN CREEK AT LYONS, CO.	31.807484	06724000	SVCLYOCO
00205012	Saint Vrain Creek	00205012_031.9					
00205012	Saint Vrain Creek	00205012_032.0					
00205012	Saint Vrain Creek	00205012_032.1					
00205012	Saint Vrain Creek	00205012_032.2					

GNIS_ID	GNIS_Name	GNIS_ID_FMEAS	SGReal_statname	SGReal_meas_act	DivWDID	DivName	DivMEAS_ACT	DivWDID_2
00178190	North Saint Vrain Creek	00178190_000.0			0501040	MILLER DIVERSION	0.093695	
00178190	North Saint Vrain Creek	00178190_000.1						
00178190	North Saint Vrain Creek	00178190_000.2						
00178190	North Saint Vrain Creek	00178190_000.3						
00178190	North Saint Vrain Creek	00178190_000.4						
00178190	North Saint Vrain Creek	00178190_000.5						
00178190	North Saint Vrain Creek	00178190_000.6						
00178190	North Saint Vrain Creek	00178190_000.7						
00178190	North Saint Vrain Creek	00178190_000.8						
00178246	South Saint Vrain Creek	00178246_000.0						
00178246	South Saint Vrain Creek	00178246_000.1						
00178246	South Saint Vrain Creek	00178246_000.2						
00178246	South Saint Vrain Creek	00178246_000.3						
00178246	South Saint Vrain Creek	00178246_000.4						
00178246	South Saint Vrain Creek	00178246_000.5						
00178246	South Saint Vrain Creek	00178246_000.6						
00178246	South Saint Vrain Creek	00178246_000.7			0500522	LONGMONT SOUTH PIPELINE	0.784191	
00178246	South Saint Vrain Creek	00178246_000.8			0500519	REESE STILES DITCH	0.842252	
00205012	Saint Vrain Creek	00205012_031.4						
00205012	Saint Vrain Creek	00205012_031.5						
00205012	Saint Vrain Creek	00205012_031.6			0500526	HIGHLAND DITCH	31.623793	0502914
00205012	Saint Vrain Creek	00205012_031.7			0502406	BLDR FDR CNL ST VRAIN RT	31.731628	
00205012	Saint Vrain Creek	00205012_031.8	SAINT VRAIN CREEK AT LYONS, CO	31.807484				
00205012	Saint Vrain Creek	00205012_031.9						
00205012	Saint Vrain Creek	00205012_032.0			0502408	BOULDER FEEDER TO SUPPLY CANAL	32.038546	
00205012	Saint Vrain Creek	00205012_032.1						
00205012	Saint Vrain Creek	00205012_032.2						

GNIS_ID	GNIS_Name	GNIS_ID_FMEAS	DivName_2	DivMEAS_ACT_2	DivMEAS_ACT_6
00178190	North Saint Vrain Creek	00178190_000.0			
00178190	North Saint Vrain Creek	00178190_000.1			
00178190	North Saint Vrain Creek	00178190_000.2			
00178190	North Saint Vrain Creek	00178190_000.3			
00178190	North Saint Vrain Creek	00178190_000.4			
00178190	North Saint Vrain Creek	00178190_000.5			
00178190	North Saint Vrain Creek	00178190_000.6			
00178190	North Saint Vrain Creek	00178190_000.7			
00178190	North Saint Vrain Creek	00178190_000.8			
00178246	South Saint Vrain Creek	00178246_000.0			
00178246	South Saint Vrain Creek	00178246_000.1			
00178246	South Saint Vrain Creek	00178246_000.2			
00178246	South Saint Vrain Creek	00178246_000.3			
00178246	South Saint Vrain Creek	00178246_000.4			
00178246	South Saint Vrain Creek	00178246_000.5			
00178246	South Saint Vrain Creek	00178246_000.6			
00178246	South Saint Vrain Creek	00178246_000.7			
00178246	South Saint Vrain Creek	00178246_000.8			
00205012	Saint Vrain Creek	00205012_031.4			
00205012	Saint Vrain Creek	00205012_031.5			
00205012	Saint Vrain Creek	00205012_031.6	HIGHLAND DITCH LEFT IN S	31.615406	
00205012	Saint Vrain Creek	00205012_031.7			
00205012	Saint Vrain Creek	00205012_031.8			
00205012	Saint Vrain Creek	00205012_031.9			
00205012	Saint Vrain Creek	00205012_032.0			
00205012	Saint Vrain Creek	00205012_032.1			
00205012	Saint Vrain Creek	00205012_032.2			

South Platte Basin Implementation Plan Output

Stream Mile Representation Framework Output for the South Platte River above Elevenmile Reservoir.

SMRF Output

South Platte River above Elevenmile

GNIS_ID	GNIS_Name	GNIS_ID_FMEAS	FMEAS	TMEAS	FocusArea	Type	Rationale	FocusAreaID
00201759	South Platte River	00201759_334.5	334.5	334.6	South Platte River: M	Environmental and Recreational	Gold Medal Fisheries, Whitewater Boating, SWAs, Elever	7
00201759	South Platte River	00201759_334.6	334.6	334.7	South Platte River: M	Environmental and Recreational	Gold Medal Fisheries, Whitewater Boating, SWAs, Elever	7
00201759	South Platte River	00201759_334.7	334.7	334.8	South Platte River: M	Environmental and Recreational	Gold Medal Fisheries, Whitewater Boating, SWAs, Elever	7
00201759	South Platte River	00201759_334.8	334.8	334.9	South Platte River: M	Environmental and Recreational	Gold Medal Fisheries, Whitewater Boating, SWAs, Elever	7
00201759	South Platte River	00201759_334.9	334.9	335.0	South Platte River: M	Environmental and Recreational	Gold Medal Fisheries, Whitewater Boating, SWAs, Elever	7
00201759	South Platte River	00201759_335.0	335.0	335.1	South Platte River: M	Environmental and Recreational	Gold Medal Fisheries, Whitewater Boating, SWAs, Elever	7
00201759	South Platte River	00201759_335.1	335.1	335.2	South Platte River: M	Environmental and Recreational	Gold Medal Fisheries, Whitewater Boating, SWAs, Elever	7
00201759	South Platte River	00201759_335.2	335.2	335.3	South Platte River: M	Environmental and Recreational	Gold Medal Fisheries, Whitewater Boating, SWAs, Elever	7
00201759	South Platte River	00201759_335.3	335.3	335.4	South Platte River: M	Environmental and Recreational	Gold Medal Fisheries, Whitewater Boating, SWAs, Elever	7
00201759	South Platte River	00201759_335.4	335.4	335.5	South Platte River: M	Environmental and Recreational	Gold Medal Fisheries, Whitewater Boating, SWAs, Elever	7
00201759	South Platte River	00201759_335.5	335.5	335.6	South Platte River: M	Environmental and Recreational	Gold Medal Fisheries, Whitewater Boating, SWAs, Elever	7
00201759	South Platte River	00201759_335.6	335.6	335.7	South Platte River: M	Environmental and Recreational	Gold Medal Fisheries, Whitewater Boating, SWAs, Elever	7
00201759	South Platte River	00201759_335.7	335.7	335.8	South Platte River: M	Environmental and Recreational	Gold Medal Fisheries, Whitewater Boating, SWAs, Elever	7
00201759	South Platte River	00201759_335.8	335.8	335.9	South Platte River: M	Environmental and Recreational	Gold Medal Fisheries, Whitewater Boating, SWAs, Elever	7
00201759	South Platte River	00201759_335.9	335.9	336.0	South Platte River: M	Environmental and Recreational	Gold Medal Fisheries, Whitewater Boating, SWAs, Elever	7
00201759	South Platte River	00201759_336.0	336.0	336.1	South Platte River: M	Environmental and Recreational	Gold Medal Fisheries, Whitewater Boating, SWAs, Elever	7
00201759	South Platte River	00201759_336.1	336.1	336.2	South Platte River: M	Environmental and Recreational	Gold Medal Fisheries, Whitewater Boating, SWAs, Elever	7
00201759	South Platte River	00201759_336.2	336.2	336.3	South Platte River: M	Environmental and Recreational	Gold Medal Fisheries, Whitewater Boating, SWAs, Elever	7
00201759	South Platte River	00201759_336.3	336.3	336.4	South Platte River: M	Environmental and Recreational	Gold Medal Fisheries, Whitewater Boating, SWAs, Elever	7
00201759	South Platte River	00201759_336.4	336.4	336.5	South Platte River: M	Environmental and Recreational	Gold Medal Fisheries, Whitewater Boating, SWAs, Elever	7
00201759	South Platte River	00201759_336.5	336.5	336.6	South Platte River: M	Environmental and Recreational	Gold Medal Fisheries, Whitewater Boating, SWAs, Elever	7
00201759	South Platte River	00201759_336.6	336.6	336.7	South Platte River: M	Environmental and Recreational	Gold Medal Fisheries, Whitewater Boating, SWAs, Elever	7
00201759	South Platte River	00201759_336.7	336.7	336.8	South Platte River: M	Environmental and Recreational	Gold Medal Fisheries, Whitewater Boating, SWAs, Elever	7
00201759	South Platte River	00201759_336.8	336.8	336.9	South Platte River: M	Environmental and Recreational	Gold Medal Fisheries, Whitewater Boating, SWAs, Elever	7
00201759	South Platte River	00201759_336.9	336.9	337.0	South Platte River: M	Environmental and Recreational	Gold Medal Fisheries, Whitewater Boating, SWAs, Elever	7
00201759	South Platte River	00201759_337.0	337.0	337.1	South Platte River: M	Environmental and Recreational	Gold Medal Fisheries, Whitewater Boating, SWAs, Elever	7
00201759	South Platte River	00201759_337.1	337.1	337.2	South Platte River: M	Environmental and Recreational	Gold Medal Fisheries, Whitewater Boating, SWAs, Elever	7
00201759	South Platte River	00201759_337.2	337.2	337.3	South Platte River: M	Environmental and Recreational	Gold Medal Fisheries, Whitewater Boating, SWAs, Elever	7
00201759	South Platte River	00201759_337.3	337.3	337.4	South Platte River: M	Environmental and Recreational	Gold Medal Fisheries, Whitewater Boating, SWAs, Elever	7
00201759	South Platte River	00201759_337.4	337.4	337.5	South Platte River: M	Environmental and Recreational	Gold Medal Fisheries, Whitewater Boating, SWAs, Elever	7
00201759	South Platte River	00201759_337.5	337.5	337.6	South Platte River: M	Environmental and Recreational	Gold Medal Fisheries, Whitewater Boating, SWAs, Elever	7

GNIS_ID	GNIS_Name	GNIS_ID_FMEAS	GMTroutStream	IowaDarter	LakeLevel	RarePlants	StreamFishing	Waterfowl	Segment_No	Basin	PRJ_20
00201759	South Platte River	00201759_334.5	Yes	Yes		Yes	Yes		7	South Platte	
00201759	South Platte River	00201759_334.6	Yes	Yes		Yes	Yes		7	South Platte	
00201759	South Platte River	00201759_334.7	Yes	Yes		Yes	Yes		7	South Platte	
00201759	South Platte River	00201759_334.8	Yes	Yes		Yes	Yes		7	South Platte	
00201759	South Platte River	00201759_334.9	Yes	Yes		Yes	Yes		7	South Platte	
00201759	South Platte River	00201759_335.0	Yes	Yes		Yes	Yes		7	South Platte	
00201759	South Platte River	00201759_335.1	Yes	Yes		Yes	Yes		7	South Platte	
00201759	South Platte River	00201759_335.2	Yes	Yes		Yes	Yes		7	South Platte	
00201759	South Platte River	00201759_335.3	Yes	Yes		Yes	Yes		7	South Platte	
00201759	South Platte River	00201759_335.4	Yes	Yes		Yes	Yes		7	South Platte	
00201759	South Platte River	00201759_335.5	Yes	Yes		Yes	Yes		7	South Platte	
00201759	South Platte River	00201759_335.6	Yes	Yes		Yes	Yes		7	South Platte	
00201759	South Platte River	00201759_335.7	Yes	Yes		Yes	Yes		7	South Platte	
00201759	South Platte River	00201759_335.8	Yes	Yes		Yes	Yes		7	South Platte	
00201759	South Platte River	00201759_335.9	Yes	Yes		Yes	Yes		7	South Platte	
00201759	South Platte River	00201759_336.0	Yes	Yes		Yes	Yes		7	South Platte	
00201759	South Platte River	00201759_336.1	Yes	Yes		Yes	Yes	Yes	7	South Platte	
00201759	South Platte River	00201759_336.2	Yes	Yes		Yes	Yes	Yes	7	South Platte	
00201759	South Platte River	00201759_336.3	Yes	Yes		Yes	Yes	Yes	7	South Platte	
00201759	South Platte River	00201759_336.4	Yes	Yes		Yes	Yes	Yes	7	South Platte	
00201759	South Platte River	00201759_336.5	Yes	Yes	Yes	Yes	Yes	Yes	7	South Platte	CDOW_104
00201759	South Platte River	00201759_336.6	Yes	Yes	Yes		Yes	Yes	7	South Platte	CDOW_104
00201759	South Platte River	00201759_336.7	Yes	Yes	Yes		Yes	Yes	7	South Platte	CDOW_104
00201759	South Platte River	00201759_336.8	Yes	Yes	Yes		Yes	Yes	7	South Platte	CDOW_104
00201759	South Platte River	00201759_336.9	Yes	Yes	Yes		Yes	Yes	7	South Platte	CDOW_104
00201759	South Platte River	00201759_337.0	Yes	Yes	Yes		Yes	Yes	7	South Platte	CDOW_104
00201759	South Platte River	00201759_337.1	Yes	Yes	Yes		Yes	Yes	7	South Platte	CDOW_104
00201759	South Platte River	00201759_337.2	Yes	Yes	Yes		Yes	Yes	7	South Platte	CDOW_104
00201759	South Platte River	00201759_337.3	Yes	Yes	Yes		Yes	Yes	7	South Platte	CDOW_104
00201759	South Platte River	00201759_337.4	Yes	Yes	Yes		Yes	Yes	7	South Platte	CDOW_104
00201759	South Platte River	00201759_337.5	Yes	Yes	Yes		Yes	Yes	7	South Platte	CDOW_104

GNIS_ID	GNIS_Name	GNIS_ID_FMEAS	PRJ_21	PRJ_28	PRJ_29	PRJ_30	PRJ_31	PRJ_32	PRJ_33	ProjectID	SGHist_usgsstatid
00201759	South Platte River	00201759_334.5		CDOW_13	CDOW_31	CDOW_32	CDOW_34	CDOW_35		CDOW_34	
00201759	South Platte River	00201759_334.6		CDOW_13	CDOW_31	CDOW_32	CDOW_34	CDOW_35		CDOW_34	
00201759	South Platte River	00201759_334.7		CDOW_13	CDOW_31	CDOW_32	CDOW_34	CDOW_35		CDOW_34	
00201759	South Platte River	00201759_334.8		CDOW_13	CDOW_31	CDOW_32	CDOW_34	CDOW_35		CDOW_34	
00201759	South Platte River	00201759_334.9		CDOW_13	CDOW_31	CDOW_32	CDOW_34	CDOW_35		CDOW_34	
00201759	South Platte River	00201759_335.0		CDOW_13	CDOW_31	CDOW_32	CDOW_34	CDOW_35		CDOW_34	
00201759	South Platte River	00201759_335.1		CDOW_13	CDOW_31	CDOW_32	CDOW_34	CDOW_35		CDOW_34	
00201759	South Platte River	00201759_335.2		CDOW_13	CDOW_31	CDOW_32	CDOW_34	CDOW_35		CDOW_34	
00201759	South Platte River	00201759_335.3		CDOW_13	CDOW_31	CDOW_32	CDOW_34	CDOW_35		CDOW_34	
00201759	South Platte River	00201759_335.4		CDOW_13	CDOW_31	CDOW_32	CDOW_34	CDOW_35		CDOW_34	
00201759	South Platte River	00201759_335.5		CDOW_13	CDOW_31	CDOW_32	CDOW_34	CDOW_35		CDOW_34	
00201759	South Platte River	00201759_335.6		CDOW_13	CDOW_31	CDOW_32	CDOW_34	CDOW_35		CDOW_34	
00201759	South Platte River	00201759_335.7		CDOW_13	CDOW_31	CDOW_32	CDOW_34	CDOW_35		CDOW_34	
00201759	South Platte River	00201759_335.8		CDOW_13	CDOW_31	CDOW_32	CDOW_34	CDOW_35		CDOW_34	
00201759	South Platte River	00201759_335.9		CDOW_13	CDOW_31	CDOW_32	CDOW_34	CDOW_35		CDOW_34	
00201759	South Platte River	00201759_336.0		CDOW_13	CDOW_31	CDOW_32	CDOW_34	CDOW_35		CDOW_34	06695000
00201759	South Platte River	00201759_336.1		CDOW_13	CDOW_31	CDOW_32	CDOW_34	CDOW_35		CDOW_34	
00201759	South Platte River	00201759_336.2		CDOW_13	CDOW_31	CDOW_32	CDOW_34	CDOW_35		CDOW_34	
00201759	South Platte River	00201759_336.3		CDOW_13	CDOW_31	CDOW_32	CDOW_34	CDOW_35		CDOW_34	
00201759	South Platte River	00201759_336.4		CDOW_13	CDOW_31	CDOW_32	CDOW_34	CDOW_35		CDOW_34	
00201759	South Platte River	00201759_336.5	CDOW_108	CDOW_13	CDOW_31	CDOW_32	CDOW_34	CDOW_35	Stewardship_21447	Stewardsh	
00201759	South Platte River	00201759_336.6	CDOW_108	CDOW_13	CDOW_31	CDOW_32	CDOW_34	CDOW_35	Stewardship_21447	Stewardsh	
00201759	South Platte River	00201759_336.7	CDOW_108	CDOW_13	CDOW_31	CDOW_32	CDOW_34	CDOW_35	Stewardship_21447	Stewardsh	
00201759	South Platte River	00201759_336.8	CDOW_108	CDOW_13	CDOW_31	CDOW_32	CDOW_34	CDOW_35	Stewardship_21447	Stewardsh	
00201759	South Platte River	00201759_336.9	CDOW_108	CDOW_13	CDOW_31	CDOW_32	CDOW_34	CDOW_35	Stewardship_21447	Stewardsh	
00201759	South Platte River	00201759_337.0	CDOW_108	CDOW_13	CDOW_31	CDOW_32	CDOW_34	CDOW_35	Stewardship_21447	Stewardsh	
00201759	South Platte River	00201759_337.1	CDOW_108	CDOW_13	CDOW_31	CDOW_32	CDOW_34	CDOW_35	Stewardship_21447	Stewardsh	
00201759	South Platte River	00201759_337.2	CDOW_108	CDOW_13	CDOW_31	CDOW_32	CDOW_34	CDOW_35	Stewardship_21447	Stewardsh	
00201759	South Platte River	00201759_337.3	CDOW_108	CDOW_13	CDOW_31	CDOW_32	CDOW_34	CDOW_35	Stewardship_21447	Stewardsh	
00201759	South Platte River	00201759_337.4	CDOW_108	CDOW_13	CDOW_31	CDOW_32	CDOW_34	CDOW_35	Stewardship_21447	Stewardsh	
00201759	South Platte River	00201759_337.5	CDOW_108	CDOW_13	CDOW_31	CDOW_32	CDOW_34	CDOW_35	Stewardship_21447	Stewardsh	

GNIS_ID	GNIS_Name	GNIS_ID_FMEAS	SGHist_dwrabbrev	SGHist_statname	SGHist_meas_act	SGReal_usgsstatid	SGReal_dwrabbrev
00201759	South Platte River	00201759_334.5					
00201759	South Platte River	00201759_334.6					
00201759	South Platte River	00201759_334.7					
00201759	South Platte River	00201759_334.8					
00201759	South Platte River	00201759_334.9					
00201759	South Platte River	00201759_335.0					
00201759	South Platte River	00201759_335.1					
00201759	South Platte River	00201759_335.2					
00201759	South Platte River	00201759_335.3					
00201759	South Platte River	00201759_335.4					
00201759	South Platte River	00201759_335.5					
00201759	South Platte River	00201759_335.6					
00201759	South Platte River	00201759_335.7					
00201759	South Platte River	00201759_335.8					
00201759	South Platte River	00201759_335.9					
00201759	South Platte River	00201759_336.0	PLAHARCO	S PLATTE RIV AB 11-MILE CANYON RES, NR HARTSEL, CO	336.077464	06695000	PLAHARCO
00201759	South Platte River	00201759_336.1					
00201759	South Platte River	00201759_336.2					
00201759	South Platte River	00201759_336.3					
00201759	South Platte River	00201759_336.4					
00201759	South Platte River	00201759_336.5					
00201759	South Platte River	00201759_336.6					
00201759	South Platte River	00201759_336.7					
00201759	South Platte River	00201759_336.8					
00201759	South Platte River	00201759_336.9					
00201759	South Platte River	00201759_337.0					
00201759	South Platte River	00201759_337.1					
00201759	South Platte River	00201759_337.2					
00201759	South Platte River	00201759_337.3					
00201759	South Platte River	00201759_337.4					
00201759	South Platte River	00201759_337.5					

GNIS_ID	GNIS_Name	GNIS_ID_FMEAS	SGReal_statname	SGReal_meas_act	DivWDID	DivName	DivMEAS_ACT
00201759	South Platte River	00201759_334.5					
00201759	South Platte River	00201759_334.6					
00201759	South Platte River	00201759_334.7			2300715	COMO JIM DITCH	334.724171
00201759	South Platte River	00201759_334.8					
00201759	South Platte River	00201759_334.9					
00201759	South Platte River	00201759_335.0					
00201759	South Platte River	00201759_335.1					
00201759	South Platte River	00201759_335.2					
00201759	South Platte River	00201759_335.3					
00201759	South Platte River	00201759_335.4					
00201759	South Platte River	00201759_335.5					
00201759	South Platte River	00201759_335.6					
00201759	South Platte River	00201759_335.7					
00201759	South Platte River	00201759_335.8					
00201759	South Platte River	00201759_335.9					
00201759	South Platte River	00201759_336.0	SOUTH PLATTE RIVER ABOVE ELEVENMILE RESERVOIR	336.077464			
00201759	South Platte River	00201759_336.1					
00201759	South Platte River	00201759_336.2			2300714	ROGERS NORTH DITCH	336.231343
00201759	South Platte River	00201759_336.3					
00201759	South Platte River	00201759_336.4					
00201759	South Platte River	00201759_336.5					
00201759	South Platte River	00201759_336.6					
00201759	South Platte River	00201759_336.7					
00201759	South Platte River	00201759_336.8					
00201759	South Platte River	00201759_336.9			2300713	ROGERS SOUTH DITCH	336.944705
00201759	South Platte River	00201759_337.0					
00201759	South Platte River	00201759_337.1					
00201759	South Platte River	00201759_337.2					
00201759	South Platte River	00201759_337.3					
00201759	South Platte River	00201759_337.4					
00201759	South Platte River	00201759_337.5					

South Platte Basin Implementation Plan Output

Stream Mile Representation Framework Output for the South Platte River below Chatfield Reservoir.

GNIS_ID	GNIS_Name	GNIS_ID_FMEAS	FMEAS	TMEAS	Geographic	FocusArea	Type	Rationale	FocusAreaID	BirdArea
00201759	South Platte River	00201759_255.4	255.4	255.5	Denver Metro South Metro	South Platte River Below Chatfield Reservoir to Sa	Recreational	Whitewat	4	Yes
00201759	South Platte River	00201759_255.5	255.5	255.6	Denver Metro South Metro	South Platte River Below Chatfield Reservoir to Sa	Recreational	Whitewat	4	Yes
00201759	South Platte River	00201759_255.6	255.6	255.7	Denver Metro South Metro	South Platte River Below Chatfield Reservoir to Sa	Recreational	Whitewat	4	Yes
00201759	South Platte River	00201759_255.7	255.7	255.8	Denver Metro South Metro	South Platte River Below Chatfield Reservoir to Sa	Recreational	Whitewat	4	Yes
00201759	South Platte River	00201759_255.8	255.8	255.9	Denver Metro South Metro	South Platte River Below Chatfield Reservoir to Sa	Recreational	Whitewat	4	Yes
00201759	South Platte River	00201759_255.9	255.9	256.0	Denver Metro South Metro	South Platte River Below Chatfield Reservoir to Sa	Recreational	Whitewat	4	Yes
00201759	South Platte River	00201759_256.0	256.0	256.1	Denver Metro South Metro	South Platte River Below Chatfield Reservoir to Sa	Recreational	Whitewat	4	Yes
00201759	South Platte River	00201759_256.1	256.1	256.2	Denver Metro South Metro	South Platte River Below Chatfield Reservoir to Sa	Recreational	Whitewat	4	Yes
00201759	South Platte River	00201759_256.2	256.2	256.3	Denver Metro South Metro	South Platte River Below Chatfield Reservoir to Sa	Recreational	Whitewat	4	Yes
00201759	South Platte River	00201759_256.3	256.3	256.4	Denver Metro South Metro	South Platte River Below Chatfield Reservoir to Sa	Recreational	Whitewat	4	Yes
00201759	South Platte River	00201759_256.4	256.4	256.5	Denver Metro South Metro	South Platte River Below Chatfield Reservoir to Sa	Recreational	Whitewat	4	Yes
00201759	South Platte River	00201759_256.5	256.5	256.6	Denver Metro South Metro	South Platte River Below Chatfield Reservoir to Sa	Recreational	Whitewat	4	Yes
00201759	South Platte River	00201759_256.6	256.6	256.7	Denver Metro South Metro	South Platte River Below Chatfield Reservoir to Sa	Recreational	Whitewat	4	Yes
00201759	South Platte River	00201759_256.7	256.7	256.8	Denver Metro South Metro	South Platte River Below Chatfield Reservoir to Sa	Recreational	Whitewat	4	Yes
00201759	South Platte River	00201759_256.8	256.8	256.9	Denver Metro South Metro	South Platte River Below Chatfield Reservoir to Sa	Recreational	Whitewat	4	Yes
00201759	South Platte River	00201759_256.9	256.9	257.0	Denver Metro South Metro	South Platte River Below Chatfield Reservoir to Sa	Recreational	Whitewat	4	Yes
00201759	South Platte River	00201759_257.0	257.0	257.1	Denver Metro South Metro	South Platte River Below Chatfield Reservoir to Sa	Recreational	Whitewat	4	Yes
00201759	South Platte River	00201759_257.1	257.1	257.2	Denver Metro South Metro	South Platte River Below Chatfield Reservoir to Sa	Recreational	Whitewat	4	Yes
00201759	South Platte River	00201759_257.2	257.2	257.3	Denver Metro South Metro	South Platte River Below Chatfield Reservoir to Sa	Recreational	Whitewat	4	Yes
00201759	South Platte River	00201759_257.3	257.3	257.4	Denver Metro South Metro	South Platte River Below Chatfield Reservoir to Sa	Recreational	Whitewat	4	Yes
00201759	South Platte River	00201759_257.4	257.4	257.5	Denver Metro South Metro	South Platte River Below Chatfield Reservoir to Sa	Recreational	Whitewat	4	Yes
00201759	South Platte River	00201759_257.5	257.5	257.6	Denver Metro South Metro	South Platte River Below Chatfield Reservoir to Sa	Recreational	Whitewat	4	Yes
00201759	South Platte River	00201759_257.6	257.6	257.7	Denver Metro South Metro	South Platte River Below Chatfield Reservoir to Sa	Recreational	Whitewat	4	Yes
00201759	South Platte River	00201759_257.7	257.7	257.8	Denver Metro South Metro	South Platte River Below Chatfield Reservoir to Sa	Recreational	Whitewat	4	Yes
00201759	South Platte River	00201759_257.8	257.8	257.9	Denver Metro South Metro	South Platte River Below Chatfield Reservoir to Sa	Recreational	Whitewat	4	Yes
00201759	South Platte River	00201759_257.9	257.9	258.0	Denver Metro South Metro	South Platte River Below Chatfield Reservoir to Sa	Recreational	Whitewat	4	Yes
00201759	South Platte River	00201759_258.0	258.0	258.1	Denver Metro South Metro	South Platte River Below Chatfield Reservoir to Sa	Recreational	Whitewat	4	Yes
00201759	South Platte River	00201759_258.1	258.1	258.2	Denver Metro South Metro	South Platte River Below Chatfield Reservoir to Sa	Recreational	Whitewat	4	Yes
00201759	South Platte River	00201759_258.2	258.2	258.3	Denver Metro South Metro	South Platte River Below Chatfield Reservoir to Sa	Recreational	Whitewat	4	Yes

GNIS_ID	GNIS_Name	GNIS_ID_FMEAS	ComShiner	DucksUnProjects	FlatwaterBoating	IowaDarter	LakeFishing	NLeopFrog	NRedbellyDace	OvrPrebMouse	RaftWhitewater
00201759	South Platte River	00201759_255.4	Yes			Yes				Yes	Yes
00201759	South Platte River	00201759_255.5	Yes			Yes				Yes	Yes
00201759	South Platte River	00201759_255.6	Yes			Yes				Yes	Yes
00201759	South Platte River	00201759_255.7	Yes			Yes				Yes	Yes
00201759	South Platte River	00201759_255.8	Yes			Yes				Yes	Yes
00201759	South Platte River	00201759_255.9	Yes			Yes				Yes	Yes
00201759	South Platte River	00201759_256.0	Yes			Yes				Yes	Yes
00201759	South Platte River	00201759_256.1	Yes			Yes				Yes	Yes
00201759	South Platte River	00201759_256.2	Yes			Yes				Yes	Yes
00201759	South Platte River	00201759_256.3	Yes			Yes				Yes	Yes
00201759	South Platte River	00201759_256.4	Yes			Yes				Yes	Yes
00201759	South Platte River	00201759_256.5	Yes			Yes				Yes	Yes
00201759	South Platte River	00201759_256.6	Yes			Yes				Yes	Yes
00201759	South Platte River	00201759_256.7	Yes			Yes				Yes	Yes
00201759	South Platte River	00201759_256.8	Yes			Yes				Yes	Yes
00201759	South Platte River	00201759_256.9	Yes			Yes				Yes	Yes
00201759	South Platte River	00201759_257.0	Yes			Yes				Yes	Yes
00201759	South Platte River	00201759_257.1	Yes			Yes				Yes	Yes
00201759	South Platte River	00201759_257.2	Yes			Yes				Yes	
00201759	South Platte River	00201759_257.3	Yes			Yes				Yes	
00201759	South Platte River	00201759_257.4	Yes			Yes				Yes	
00201759	South Platte River	00201759_257.5	Yes			Yes				Yes	
00201759	South Platte River	00201759_257.6	Yes			Yes				Yes	
00201759	South Platte River	00201759_257.7	Yes			Yes				Yes	
00201759	South Platte River	00201759_257.8	Yes			Yes				Yes	
00201759	South Platte River	00201759_257.9	Yes			Yes				Yes	
00201759	South Platte River	00201759_258.0	Yes			Yes				Yes	
00201759	South Platte River	00201759_258.1	Yes	Yes		Yes	Yes	Yes	Yes	Yes	
00201759	South Platte River	00201759_258.2	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	

GNIS_ID	GNIS_Name	GNIS_ID_FMEAS	RarePlants	RecCorridor	SigPlants	Segment_No	Basin	PRJ_7	PRJ_8	PRJ_9	PRJ_10	PRJ_11	PRJ_12
00201759	South Platte River	00201759_255.4	Yes	Yes									
00201759	South Platte River	00201759_255.5	Yes	Yes									
00201759	South Platte River	00201759_255.6	Yes	Yes									
00201759	South Platte River	00201759_255.7	Yes	Yes									
00201759	South Platte River	00201759_255.8	Yes	Yes									
00201759	South Platte River	00201759_255.9	Yes	Yes									
00201759	South Platte River	00201759_256.0	Yes	Yes									
00201759	South Platte River	00201759_256.1	Yes	Yes									
00201759	South Platte River	00201759_256.2	Yes	Yes									
00201759	South Platte River	00201759_256.3	Yes	Yes									
00201759	South Platte River	00201759_256.4	Yes	Yes									
00201759	South Platte River	00201759_256.5	Yes	Yes									
00201759	South Platte River	00201759_256.6	Yes	Yes									
00201759	South Platte River	00201759_256.7	Yes	Yes									
00201759	South Platte River	00201759_256.8	Yes	Yes		4	South Platte	290	291	CDOW_31	CDOW_32	CDOW_34	CDOW_35
00201759	South Platte River	00201759_256.9	Yes			4	South Platte	290	291	CDOW_31	CDOW_32	CDOW_34	CDOW_35
00201759	South Platte River	00201759_257.0	Yes			4	South Platte	290	291	CDOW_31	CDOW_32	CDOW_34	CDOW_35
00201759	South Platte River	00201759_257.1	Yes			4	South Platte	290	291	CDOW_31	CDOW_32	CDOW_34	CDOW_35
00201759	South Platte River	00201759_257.2	Yes			4	South Platte	290	291	CDOW_31	CDOW_32	CDOW_34	CDOW_35
00201759	South Platte River	00201759_257.3	Yes			4	South Platte	290	291	CDOW_31	CDOW_32	CDOW_34	CDOW_35
00201759	South Platte River	00201759_257.4	Yes			4	South Platte	290	291	CDOW_31	CDOW_32	CDOW_34	CDOW_35
00201759	South Platte River	00201759_257.5	Yes			4	South Platte	290	291	CDOW_31	CDOW_32	CDOW_34	CDOW_35
00201759	South Platte River	00201759_257.6	Yes			4	South Platte	290	291	CDOW_31	CDOW_32	CDOW_34	CDOW_35
00201759	South Platte River	00201759_257.7	Yes			4	South Platte	290	291	CDOW_31	CDOW_32	CDOW_34	CDOW_35
00201759	South Platte River	00201759_257.8	Yes			4	South Platte	290	291	CDOW_31	CDOW_32	CDOW_34	CDOW_35
00201759	South Platte River	00201759_257.9	Yes			4	South Platte	290	291	CDOW_31	CDOW_32	CDOW_34	CDOW_35
00201759	South Platte River	00201759_258.0	Yes			4	South Platte	290	291	CDOW_31	CDOW_32	CDOW_34	CDOW_35
00201759	South Platte River	00201759_258.1	Yes		Yes	4	South Platte	290	291	CDOW_31	CDOW_32	CDOW_34	CDOW_35
00201759	South Platte River	00201759_258.2	Yes		Yes	4	South Platte	290	291	CDOW_31	CDOW_32	CDOW_34	CDOW_35

GNIS_ID	GNIS_Name	GNIS_ID_FMEAS	PRJ_13	ProjectID	SGHist_usgsstatid	SGHist_dwrabbrev	SGHist_statname	SGHist_meas_act
00201759	South Platte River	00201759_255.4						
00201759	South Platte River	00201759_255.5						
00201759	South Platte River	00201759_255.6						
00201759	South Platte River	00201759_255.7						
00201759	South Platte River	00201759_255.8						
00201759	South Platte River	00201759_255.9						
00201759	South Platte River	00201759_256.0						
00201759	South Platte River	00201759_256.1						
00201759	South Platte River	00201759_256.2						
00201759	South Platte River	00201759_256.3						
00201759	South Platte River	00201759_256.4						
00201759	South Platte River	00201759_256.5						
00201759	South Platte River	00201759_256.6						
00201759	South Platte River	00201759_256.7						
00201759	South Platte River	00201759_256.8		290,CDOW				
00201759	South Platte River	00201759_256.9		290,CDOW				
00201759	South Platte River	00201759_257.0		290,CDOW				
00201759	South Platte River	00201759_257.1		290,CDOW				
00201759	South Platte River	00201759_257.2		290,CDOW				
00201759	South Platte River	00201759_257.3		290,CDOW				
00201759	South Platte River	00201759_257.4		290,CDOW				
00201759	South Platte River	00201759_257.5		290,CDOW				
00201759	South Platte River	00201759_257.6		290,CDOW				
00201759	South Platte River	00201759_257.7		290,CDOW				
00201759	South Platte River	00201759_257.8		290,CDOW		PLACHACO	SOUTH PLATTE RIVER BELOW CHATFIELD RESERVOIR	257.895110
00201759	South Platte River	00201759_257.9		CDOW_34				
00201759	South Platte River	00201759_258.0		CDOW_34				
00201759	South Platte River	00201759_258.1		CDOW_34				
00201759	South Platte River	00201759_258.2	Stewardship_22290	Stewardsh				

GNIS_ID	GNIS_Name	GNIS_ID_FMEAS	DivWDID	DivName	DivMEAS_ACT	DivWDID_2	DivName_2	DivMEAS_ACT_2
00201759	South Platte River	00201759_255.4						
00201759	South Platte River	00201759_255.5	0801999	LITTLETON BOAT CHUTE NO 4	255.533628			
00201759	South Platte River	00201759_255.6						
00201759	South Platte River	00201759_255.7						
00201759	South Platte River	00201759_255.8						
00201759	South Platte River	00201759_255.9						
00201759	South Platte River	00201759_256.0						
00201759	South Platte River	00201759_256.1						
00201759	South Platte River	00201759_256.2						
00201759	South Platte River	00201759_256.3						
00201759	South Platte River	00201759_256.4	0801019	ENGLEWOOD PUMP PLANT	256.497522			
00201759	South Platte River	00201759_256.5						
00201759	South Platte River	00201759_256.6						
00201759	South Platte River	00201759_256.7	0801997	LITTLETON BOAT CHUTE NO 10	256.716711			
00201759	South Platte River	00201759_256.8						
00201759	South Platte River	00201759_256.9						
00201759	South Platte River	00201759_257.0						
00201759	South Platte River	00201759_257.1	0801023	SOUTH PLATTE PUMP	257.122285			
00201759	South Platte River	00201759_257.2						
00201759	South Platte River	00201759_257.3						
00201759	South Platte River	00201759_257.4						
00201759	South Platte River	00201759_257.5						
00201759	South Platte River	00201759_257.6						
00201759	South Platte River	00201759_257.7						
00201759	South Platte River	00201759_257.8						
00201759	South Platte River	00201759_257.9						
00201759	South Platte River	00201759_258.0	0801007	LAST CHANCE DITCH 2	258.046842	0801009	NEVADA DITCH	258.042676
00201759	South Platte River	00201759_258.1	0802914	LAST CHANCE DITCH 2 LEFT	258.152092			
00201759	South Platte River	00201759_258.2	0801008	CITY DITCH PL	258.270117	0802648	CHATFIELD FISH UNIT AUG	258.297068

South Platte Basin Implementation Plan Output

Stream Mile Representation Framework Output for the South Platte River at Balzac.

GNIS_ID	GNIS_Name	GNIS_ID_FMEAS	FMEAS	TMEAS	Geographic	FocusArea	Type	Rationale	FocusAreaID	BrassyMinnow
00201759	South Platte River	00201759_090.8	90.8	90.9	Lower South Platte Northern	South Platte Ri	Environmental and Recreational	Waterfowl	1	Yes
00201759	South Platte River	00201759_090.9	90.9	91.0	Lower South Platte Northern	South Platte Ri	Environmental and Recreational	Waterfowl	1	Yes
00201759	South Platte River	00201759_091.0	91.0	91.1	Lower South Platte Northern	South Platte Ri	Environmental and Recreational	Waterfowl	1	Yes
00201759	South Platte River	00201759_091.1	91.1	91.2	Lower South Platte Northern	South Platte Ri	Environmental and Recreational	Waterfowl	1	Yes
00201759	South Platte River	00201759_091.2	91.2	91.3	Lower South Platte Northern	South Platte Ri	Environmental and Recreational	Waterfowl	1	Yes
00201759	South Platte River	00201759_091.3	91.3	91.4	Lower South Platte Northern	South Platte Ri	Environmental and Recreational	Waterfowl	1	Yes
00201759	South Platte River	00201759_091.4	91.4	91.5	Lower South Platte Northern	South Platte Ri	Environmental and Recreational	Waterfowl	1	Yes
00201759	South Platte River	00201759_091.5	91.5	91.6	Lower South Platte Northern	South Platte Ri	Environmental and Recreational	Waterfowl	1	Yes
00201759	South Platte River	00201759_091.6	91.6	91.7	Lower South Platte Northern	South Platte Ri	Environmental and Recreational	Waterfowl	1	Yes
00201759	South Platte River	00201759_091.7	91.7	91.8	Lower South Platte Northern	South Platte Ri	Environmental and Recreational	Waterfowl	1	Yes
00201759	South Platte River	00201759_091.8	91.8	91.9	Lower South Platte Northern	South Platte Ri	Environmental and Recreational	Waterfowl	1	Yes
00201759	South Platte River	00201759_091.9	91.9	92.0	Lower South Platte Northern	South Platte Ri	Environmental and Recreational	Waterfowl	1	Yes
00201759	South Platte River	00201759_092.0	92.0	92.1	Lower South Platte Northern	South Platte Ri	Environmental and Recreational	Waterfowl	1	Yes
00201759	South Platte River	00201759_092.1	92.1	92.2	Lower South Platte Northern	South Platte Ri	Environmental and Recreational	Waterfowl	1	Yes
00201759	South Platte River	00201759_092.2	92.2	92.3	Lower South Platte Northern	South Platte Ri	Environmental and Recreational	Waterfowl	1	Yes
00201759	South Platte River	00201759_092.3	92.3	92.4	Lower South Platte Northern	South Platte Ri	Environmental and Recreational	Waterfowl	1	Yes
00201759	South Platte River	00201759_092.4	92.4	92.5	Lower South Platte Northern	South Platte Ri	Environmental and Recreational	Waterfowl	1	Yes
00201759	South Platte River	00201759_092.5	92.5	92.6	Lower South Platte Northern	South Platte Ri	Environmental and Recreational	Waterfowl	1	Yes
00201759	South Platte River	00201759_092.6	92.6	92.7	Lower South Platte Northern	South Platte Ri	Environmental and Recreational	Waterfowl	1	Yes
00201759	South Platte River	00201759_092.7	92.7	92.8	Lower South Platte Northern	South Platte Ri	Environmental and Recreational	Waterfowl	1	Yes
00201759	South Platte River	00201759_092.8	92.8	92.9	Lower South Platte Northern	South Platte Ri	Environmental and Recreational	Waterfowl	1	Yes
00201759	South Platte River	00201759_092.9	92.9	93.0	Lower South Platte Northern	South Platte Ri	Environmental and Recreational	Waterfowl	1	Yes
00201759	South Platte River	00201759_093.0	93.0	93.1	Lower South Platte Northern	South Platte Ri	Environmental and Recreational	Waterfowl	1	Yes
00201759	South Platte River	00201759_093.1	93.1	93.2	Lower South Platte Northern	South Platte Ri	Environmental and Recreational	Waterfowl	1	Yes
00201759	South Platte River	00201759_093.2	93.2	93.3	Lower South Platte Northern	South Platte Ri	Environmental and Recreational	Waterfowl	1	Yes
00201759	South Platte River	00201759_093.3	93.3	93.4	Lower South Platte Northern	South Platte Ri	Environmental and Recreational	Waterfowl	1	Yes
00201759	South Platte River	00201759_093.4	93.4	93.5	Lower South Platte Northern	South Platte Ri	Environmental and Recreational	Waterfowl	1	Yes
00201759	South Platte River	00201759_093.5	93.5	93.6	Lower South Platte Northern	South Platte Ri	Environmental and Recreational	Waterfowl	1	Yes
00201759	South Platte River	00201759_093.6	93.6	93.7	Lower South Platte Northern	South Platte Ri	Environmental and Recreational	Waterfowl	1	Yes
00201759	South Platte River	00201759_093.7	93.7	93.8	Lower South Platte Northern	South Platte Ri	Environmental and Recreational	Waterfowl	1	Yes
00201759	South Platte River	00201759_093.8	93.8	93.9	Lower South Platte Northern	South Platte Ri	Environmental and Recreational	Waterfowl	1	Yes
00201759	South Platte River	00201759_093.9	93.9	94.0	Lower South Platte Northern	South Platte Ri	Environmental and Recreational	Waterfowl	1	Yes
00201759	South Platte River	00201759_094.0	94.0	94.1	Lower South Platte Northern	South Platte Ri	Environmental and Recreational	Waterfowl	1	Yes
00201759	South Platte River	00201759_094.1	94.1	94.2	Lower South Platte Northern	South Platte Ri	Environmental and Recreational	Waterfowl	1	Yes
00201759	South Platte River	00201759_094.2	94.2	94.3	Lower South Platte Northern	South Platte Ri	Environmental and Recreational	Waterfowl	1	Yes
00201759	South Platte River	00201759_094.3	94.3	94.4	Lower South Platte Northern	South Platte Ri	Environmental and Recreational	Waterfowl	1	Yes
00201759	South Platte River	00201759_094.4	94.4	94.5	Lower South Platte Northern	South Platte Ri	Environmental and Recreational	Waterfowl	1	Yes
00201759	South Platte River	00201759_094.5	94.5	94.6	Lower South Platte Northern	South Platte Ri	Environmental and Recreational	Waterfowl	1	Yes
00201759	South Platte River	00201759_094.6	94.6	94.7	Lower South Platte Northern	South Platte Ri	Environmental and Recreational	Waterfowl	1	Yes
00201759	South Platte River	00201759_094.7	94.7	94.8	Lower South Platte Northern	South Platte Ri	Environmental and Recreational	Waterfowl	1	Yes
00201759	South Platte River	00201759_094.8	94.8	94.9	Lower South Platte Northern	South Platte Ri	Environmental and Recreational	Waterfowl	1	Yes

GNIS_ID	ComGarterSnake	(	DucksUnProjects	IowaDarter	I	(	(	PlaMinnow	I	SigPlants	S	Waterfowl	Segment_No	Basin	PRJ_1	PRJ_2	PRJ_3	PRJ_6	PRJ_7
00201759	Yes		Yes	Yes				Yes					1	South Platte	309	310	311	CDOW_31	CDOW_32
00201759	Yes		Yes	Yes				Yes					1	South Platte	309	310	311	CDOW_31	CDOW_32
00201759	Yes		Yes	Yes				Yes					1	South Platte	309	310	311	CDOW_31	CDOW_32
00201759	Yes		Yes	Yes				Yes					1	South Platte	309	310	311	CDOW_31	CDOW_32
00201759	Yes		Yes	Yes				Yes					1	South Platte	309	310	311	CDOW_31	CDOW_32
00201759	Yes		Yes	Yes				Yes					1	South Platte	309	310	311	CDOW_31	CDOW_32
00201759	Yes		Yes	Yes				Yes					1	South Platte	309	310	311	CDOW_31	CDOW_32
00201759	Yes		Yes	Yes				Yes					1	South Platte	309	310	311	CDOW_31	CDOW_32
00201759	Yes		Yes	Yes				Yes					1	South Platte	309	310	311	CDOW_31	CDOW_32
00201759	Yes		Yes	Yes				Yes					1	South Platte	309	310	311	CDOW_31	CDOW_32
00201759	Yes		Yes	Yes				Yes					1	South Platte	309	310	311	CDOW_31	CDOW_32
00201759	Yes		Yes	Yes				Yes					1	South Platte	309	310	311	CDOW_31	CDOW_32
00201759	Yes		Yes	Yes				Yes					1	South Platte	309	310	311	CDOW_31	CDOW_32
00201759	Yes		Yes	Yes				Yes					1	South Platte	309	310	311	CDOW_31	CDOW_32
00201759	Yes		Yes	Yes				Yes					1	South Platte	309	310	311	CDOW_31	CDOW_32
00201759	Yes		Yes	Yes				Yes					1	South Platte	309	310	311	CDOW_31	CDOW_32
00201759	Yes		Yes	Yes				Yes					1	South Platte	309	310	311	CDOW_31	CDOW_32
00201759	Yes		Yes	Yes				Yes					1	South Platte	309	310	311	CDOW_31	CDOW_32
00201759	Yes		Yes	Yes				Yes		Yes		Yes	1	South Platte	309	310	311	CDOW_31	CDOW_32
00201759			Yes	Yes				Yes		Yes		Yes	1	South Platte	309	310	311	CDOW_31	CDOW_32
00201759			Yes	Yes				Yes		Yes		Yes	1	South Platte	309	310	311	CDOW_31	CDOW_32
00201759			Yes	Yes				Yes		Yes		Yes	1	South Platte	309	310	311	CDOW_31	CDOW_32
00201759			Yes	Yes				Yes		Yes		Yes	1	South Platte	309	310	311	CDOW_31	CDOW_32
00201759			Yes	Yes				Yes		Yes		Yes	1	South Platte	309	310	311	CDOW_31	CDOW_32
00201759			Yes	Yes				Yes		Yes		Yes	1	South Platte	309	310	311	CDOW_31	CDOW_32
00201759			Yes	Yes				Yes		Yes		Yes	1	South Platte	309	310	311	CDOW_31	CDOW_32
00201759			Yes	Yes				Yes		Yes		Yes	1	South Platte	309	310	311	CDOW_31	CDOW_32
00201759			Yes	Yes				Yes		Yes		Yes	1	South Platte	309	310	311	CDOW_31	CDOW_32
00201759			Yes	Yes				Yes		Yes		Yes	1	South Platte	309	310	311	CDOW_31	CDOW_32
00201759			Yes	Yes				Yes		Yes		Yes	1	South Platte	309	310	311	CDOW_31	CDOW_32
00201759			Yes	Yes				Yes		Yes		Yes	1	South Platte	309	310	311	CDOW_31	CDOW_32
00201759			Yes	Yes				Yes		Yes		Yes	1	South Platte	309	310	311	CDOW_31	CDOW_32
00201759			Yes	Yes				Yes		Yes		Yes	1	South Platte	309	310	311	CDOW_31	CDOW_32
00201759			Yes	Yes				Yes		Yes		Yes	1	South Platte	309	310	311	CDOW_31	CDOW_32
00201759			Yes	Yes				Yes		Yes		Yes	1	South Platte	309	310	311	CDOW_31	CDOW_32
00201759			Yes	Yes				Yes		Yes		Yes	1	South Platte	309	310	311	CDOW_31	CDOW_32
00201759			Yes	Yes				Yes		Yes		Yes	1	South Platte	309	310	311	CDOW_31	CDOW_32
00201759			Yes	Yes				Yes		Yes		Yes	1	South Platte	309	310	311	CDOW_31	CDOW_32
00201759			Yes	Yes				Yes		Yes		Yes	1	South Platte	309	310	311	CDOW_31	CDOW_32
00201759			Yes	Yes				Yes		Yes		Yes	1	South Platte	309	310	311	CDOW_31	CDOW_32

GNIS_ID	PRJ_8	PRJ_9	I	I	PRJ_79	PRJ_80	PRJ_81	PRJ_82	PRJ_83	I	I	I	ProjectID	SGHist_usgsstatid
00201759	CDOW_34	CDOW_35											311,309,310,CDOW_3	
00201759	CDOW_34	CDOW_35											311,309,310,CDOW_3	
00201759	CDOW_34	CDOW_35											311,309,310,CDOW_3	
00201759	CDOW_34	CDOW_35											311,310,311,309,310,	
00201759	CDOW_34	CDOW_35											311,310,309,CDOW_3	
00201759	CDOW_34	CDOW_35											311,310,309,CDOW_3	
00201759	CDOW_34	CDOW_35											310,311,310,311,309,	
00201759	CDOW_34	CDOW_35											310,311,309,CDOW_3	
00201759	CDOW_34	CDOW_35											310,311,309,CDOW_3	
00201759	CDOW_34	CDOW_35											310,311,309,CDOW_3	
00201759	CDOW_34	CDOW_35											310,310,311,309,309,	
00201759	CDOW_34	CDOW_35											310,309,311,CDOW_3	
00201759	CDOW_34	CDOW_35											310,309,311,CDOW_3	
00201759	CDOW_34	CDOW_35											310,309,311,CDOW_3	
00201759	CDOW_34	CDOW_35											310,309,311,CDOW_3	
00201759	CDOW_34	CDOW_35											310,309,311,CDOW_3	
00201759	CDOW_34	CDOW_35											310,309,311,CDOW_3	
00201759	CDOW_34	CDOW_35											310,309,311,CDOW_3	
00201759	CDOW_34	CDOW_35											310,309,311,CDOW_3	06760000
00201759	CDOW_34	CDOW_35											310,309,311,CDOW_3	
00201759	CDOW_34	CDOW_35											310,309,311,CDOW_3	
00201759	CDOW_34	CDOW_35											310,309,311,CDOW_3	
00201759	CDOW_34	CDOW_35					Stewardship_30548						310,310,311,309,309,	
00201759	CDOW_34	CDOW_35					Stewardship_30548						310,311,309,Stewards	
00201759	CDOW_34	CDOW_35					Stewardship_30548						310,311,309,309,311,	
00201759	CDOW_34	CDOW_35											309,311,310,CDOW_3	
00201759	CDOW_34	CDOW_35											309,311,310,CDOW_3	
00201759	CDOW_34	CDOW_35											309,311,310,CDOW_3	
00201759	CDOW_34	CDOW_35											309,311,310,CDOW_3	
00201759	CDOW_34	CDOW_35											309,311,310,CDOW_3	
00201759	CDOW_34	CDOW_35											309,311,310,CDOW_3	
00201759	CDOW_34	CDOW_35											309,311,310,CDOW_3	
00201759	CDOW_34	CDOW_35											309,311,310,CDOW_3	
00201759	CDOW_34	CDOW_35											309,311,310,CDOW_3	
00201759	CDOW_34	CDOW_35											309,311,310,CDOW_3	
00201759	CDOW_34	CDOW_35											309,311,310,CDOW_3	
00201759	CDOW_34	CDOW_35											309,311,310,CDOW_3	
00201759	CDOW_34	CDOW_35											309,311,310,CDOW_3	
00201759	CDOW_34	CDOW_35											309,311,310,CDOW_3	
00201759	CDOW_34	CDOW_35			Stewardship_30509				Stewardship_30551				309,Stewardship_305	
00201759	CDOW_34	CDOW_35						Stewardship_30550	Stewardship_30551				311,309,Stewardship_	

GNIS_ID	SGHist_dwrabbrev	SGHist_statname	SGHist_meas_act	DivWDID	DivName	DivMEAS_ACT	DivWDID_2	DivName_2
00201759								
00201759				6400535	SOUTH PLATTE DITCH	90.903055		
00201759								
00201759								
00201759								
00201759								
00201759								
00201759								
00201759								
00201759								
00201759								
00201759								
00201759								
00201759								
00201759								
00201759								
00201759								
00201759								
00201759	PLABAACO	SOUTH PLATTE RIVER AT BALZAC, CO.	92.695480					
00201759								
00201759								
00201759								
00201759								
00201759								
00201759								
00201759								
00201759								
00201759								
00201759								
00201759								
00201759								
00201759								
00201759								
00201759								
00201759								
00201759								
00201759								
00201759								
00201759								
00201759								
00201759				0100525	TETSEL DITCH	94.823912	0100526	JOHNSON EDWARDS DITCH

GNIS_ID	DivMEAS_ACT_2	DivWDID_3	DivName_3	DivMEAS_ACT_3
00201759				
00201759				
00201759				
00201759				
00201759				
00201759				
00201759				
00201759				
00201759				
00201759				
00201759				
00201759				
00201759				
00201759				
00201759				
00201759				
00201759				
00201759				
00201759				
00201759				
00201759				
00201759				
00201759				
00201759				
00201759				
00201759				
00201759				
00201759				
00201759				
00201759				
00201759				
00201759				
00201759				
00201759				
00201759				
00201759				
00201759				
00201759				
00201759				
00201759				
00201759	94.890078	0100829	PREWITT INLET CANAL	94.890078

Source Water Route Framework
And Stream Mile Processing

TO: DWR File
FROM: Chris Brown, GIS Program Manager, Colorado Division of Water Resources
SUBJECT: Source Water Route Framework and Stream Mile Processing
DATE: December 2014
CC: Doug Stenzel

1. Introduction

The Colorado Division of Water Resources has produced the Source Water Route Framework for use as a base GIS layer to standardize the calculation of stream mile location for diversion structures, stream gages, stream confluences and other water features related to water administration. This dataset is comprised of a direct extract from the National Hydrography Dataset (NHD) with some added content to facilitate the building of the routes. This document will discuss the following topics related to the development and use of this dataset…

- *Production of the Source Water Route Framework*
- *Placing of features along the Source Water Route Framework*
- *Stream Mile calculation results*
- *Maintenance and Refresh Strategy*

2. Production of the Source Water Route Framework

The Source Water Route Framework essentially an extract of certain NHDFlowline features from the National Hydrography Dataset (NHD). In particular, CDWR used the 'High Resolution' (1:24k) version of this dataset dated 5/16/2014. The following discusses the development of the dataset:

2.1. Selection of the National Hydrography Dataset Version

CDWR is the steward of the High Resolution version of the NHD in Colorado. As a result, CDWR has a vested interest in the use of this version of the dataset. In being the steward, CDWR knows when the dataset is updated, when certain global maintenance activities are performed and a general overall sense of the quality of this version of the dataset.

2.1.1 Extraction of NHDFlowline Data

Part of the native schema of the NHD includes two fields, GNIS_Name and GNIS_ID. These attributes are from the Board of Geographic Names database which is the official repository for names of geographic features in the United States. Within the data, GNIS_Name is not unique. However, GNIS_ID is unique and allows for the distinction between like named features. To begin the building of the Source Water Route Framework, all named NHDFlowline features in the sub category of 'stream/river' within the State of Colorado are extracted to a draft file geodatabase (FGB). In addition, a number of unnamed stream/river features that have been identified as water right source waters are also extracted and imported to the draft file geodatabase. These features are unnamed because they represent hypsographic features (i.e. gulches, draws, canyons) and not hydrographic features. Currently, only hydrographic features can be named in the official version of the NHD.

2.1.2 Attribution of Unnamed Features

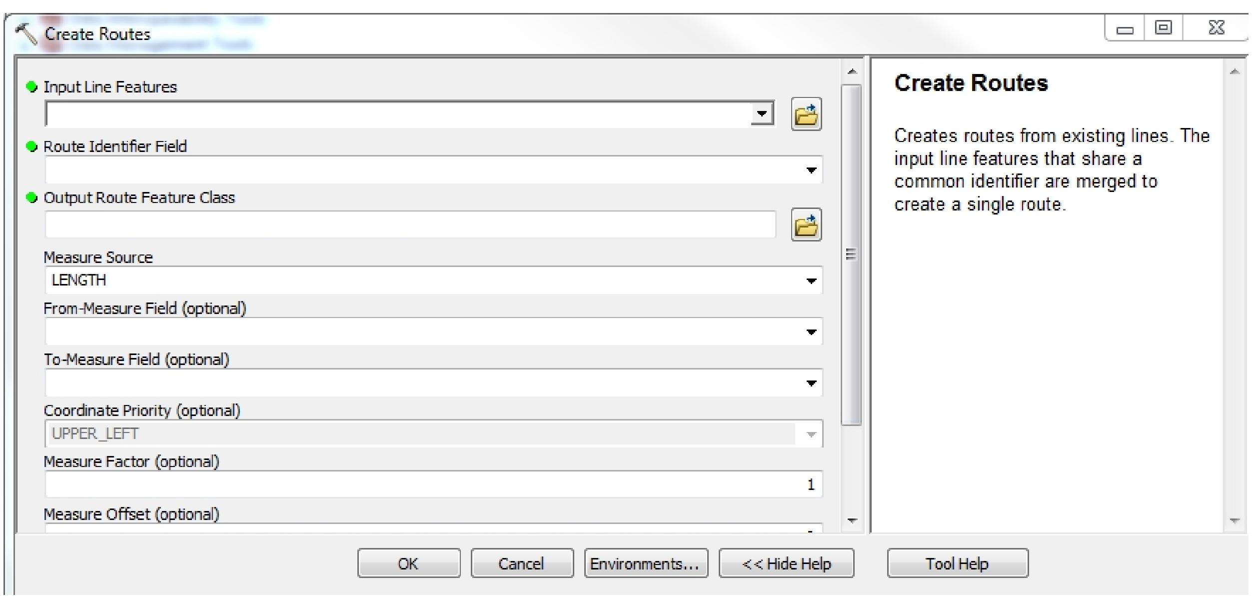
In many cases, an official name exists for the unnamed features within the NHDFlowline extract. Generally, if the feature is named on the 1:24k USGS map, it will have an official GNIS_Name and GNIS_ID. Where this case is applicable, CDWR has used the hypsographic GNIS_Name and GNIS_ID to name the NHDFlowline in the draft dataset. In other cases, unnamed features do not have an official GNIS_Name or GNIS_ID. In these cases, CDWR has attributed those NHDFlowlines with an artificial GNIS_Name and GNIS_ID. The GNIS_Name is derived from water right decrees in the vicinity of the NHDFlowline feature which name their source water stream. GNIS_ID is attributed with a fake GNIS_ID that mimics the 8 character string format of actual GNIS_IDs. Once this attribution is complete and there are no unnamed stream segments in the draft dataset, the route data can be built.

2.2 Explanation of Route Data

Route data in ArcGIS are composed of Polyline M features. Polyline M features contain 'measures' in the data that allow for a calculation of distance along a polyline. The values depend on the orientation of the line and increment from the beginning to the end of the line. Routes are defined by Route ID (RID) that defines the breadth of an individual route. Features can be placed along a route and attributed with a measure showing its sequential location on the route.

2.2.1 Building of Route Data

Route data is built using the Linear Referencing Tool / Create Routes. Input Line Features are the extracted and attributed NHDFlowline features. Route Identifier Field is GNIS_ID. Output Route Feature Class is a previously defined Polyline M feature class within the draft FGB. Measure Source is the native length of the polyline which in this case is calculated in meters. The optional parameters are left as is.

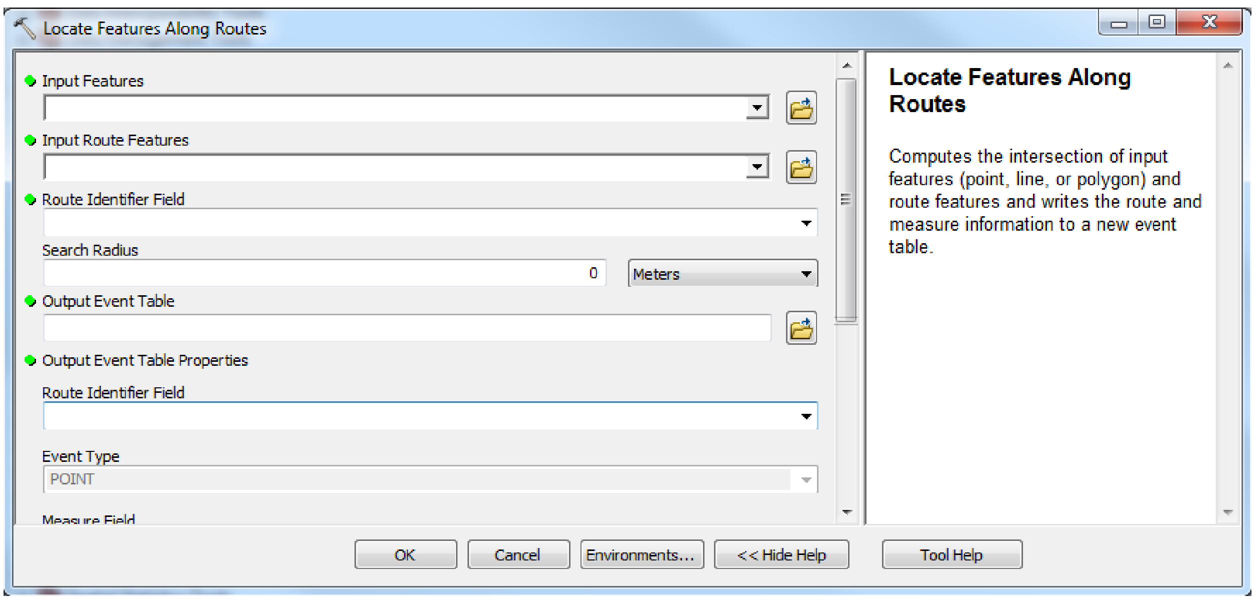


The result of using this tool creates new line features as route data which can be described as many individual line features dissolved by their common attribute (GNIS_ID) into one singular line feature with dynamic distance measures incrementing along the line from beginning to end.

After the initial draft dataset is completed, the routes need to be checked for correct alignment and in many cases, a route maybe flowing in the wrong direction. This is simply fixed by flipping the route feature and re-setting the measure of the downstream end to zero. Once this draft route data has been quality controlled, it is loaded into a fresh FGB for locating of features along the routes.

3.   Locating of Features along Routes

Point features can be located along routes using the using the Linear Referencing Tool / Locate Features Along Routes. Input Features are the points to be located along the route. Input Route Features is the route layer to locate the point along. Route Identifier Field is GNIS_ID within the route layer table. Search radius is left to zero for features snapped to the route data.



A table is produced as a result of running this tool. Three fields are appended to the front of the input feature data's table…RID, MEAS and Distance. RID is the route id (GNIS_ID) of the route feature. MEAS is the measured location of the feature on the route and Distance is the distance of the point, in a straight line, to the route.

3.1 Locating of CDWR Data along Routes

CDWR point data may or may not fall directly on the generated route features. As a result, CDWR developed a custom ArcGIS tool that locates CDWR point data by first selecting the route feature the CDWR point is related to and determining its stream mile location. The tool iterates through the data, making these associations to choose the correct source water for each point. This is necessary because the basic tool will snap points to the closest route regardless of whether that route is the actual source water for a particular water right.

3.2 Stream Mile Confluence Points Dataset

CDWR has produced a companion dataset to the Source Water Route Framework. The Stream Mile Confluence point dataset is composed of a set of points used to generate the stream mile location of confluence points between main streams and their tributary streams. These points are snapped to the Source Water Route Framework and are attributed with stream mile location using the 'Locate Features Along Routes' tool in ArcGIS.

4. Stream Mile Calculation Results

Stream mile calculation results are delivered as a table in the file geodatabase. Three fields are appended to the front of the input point feature's data schema as mentioned above. In DWR's case, the 'MEAS' field is calculated in meters. The value is converted to miles and the resulting value is captured in the field 'Strm_Mile'. The 'Distance' field can be used as a quality control metric since this value is a calculation of the distance a point traveled to be snapped to it source water. CDWR will use this value to either potentially update the location of a feature or evaluate if the feature has been coded with the correct water source. The farther a feature is from its source water, the accuracy of the feature's location or coded source water is more suspect.

5. Maintenance and Refresh Strategy

As new water right source waters are identified, new routes will the added to the Source Water Route Framework. The process is simple. A new source water stream is identified and the data is extracted from the NHD. A determination is made regarding the GNIS_Name and GNIS_ID of the source water as whether to use an existing GNIS_Name and GNIS_ID or create a DWR version. Once the matter is settled, a single route is developed from the native data and loaded into the Source Water Route Framework. If the stream is tributary to another stream, a confluence point is generated to calculate the stream mile of that confluence. At this point, the route is fully incorporated into the Source Water Route Framework.

As the NHD evolves and more accurate data is developed, the Source Water Route Framework will need to be refreshed from time to time. CDWR will know when wholesale changes have been made to the native NHD that necessitate a refresh of the Source Water Route Framework. Depending on the breadth of change, CDWR will either refresh the whole dataset or portions.