

**Watershed and Streams Classification Project
Weyerhaeuser – Edson / Drayton Valley**

Delivery Data Set Description

The intention of this document is to describe deliverables requested by the client, summarize applied procedures, and to outline possible future opportunities arising from interim products created for this project.

The project goal was to outline watershed basins in Weyerhaeuser FMA suitable for forest management planning activities while consistent with government-approved approach.

Specific project objectives were to:

- Apply Strahler classification to stream network consistently with processes used on government and related projects.
- Delineate reasonable accuracy watersheds and create a seamless division of study area into class 4 and higher, and class 3 and higher sub-basins. Both polygon coverage supplements individual class 4 or 3 sub-basins with remaining portions of class 5, 6, 7 ... basins.
- Cooperate with client to define unique naming schema for all watershed areas within FMA.

Strahler classified streams and named watersheds are prime deliverables from this project, but within its scope other valuable interim products were also created. Corrected Base Features Single Line Network with pre-designed routes, Hydro-corrected DEM, and detailed watersheds are examples of data sets that could provide further information and be utilized for more extensive analysis. Other watershed related projects have additional deliverables for drainage area accumulation analysis, routes for event modeling, gradient based reaches for detailed stream classification etc.

The following documentation of deliverables (and corresponding data display project) is intended to depict prime deliverables requested by client. Some interim data are included to demonstrate process or to support discussion on future opportunities and more extensive analysis.

Analysis of upstream areas for stream crossing, modeling events on routes, interactive waterlease delineation, and even construction of hydrocodes could progress from the created data sets. GISmo Solutions Ltd would welcome and opportunity to review other Weyerhaeuser client requirements and to explain available options.

Weyer CDROM Data Description

This CDROM contains single line hydrography, hydrography polygons, and Digital Elevation Model (DEM) data as binary ARC/INFO coverages (line, polygon, and grid types) prepared within the ARC/INFO 8.2 environment. An ArcView 3.2 project, for data overview, and critical files in e00 export format are also provided. The projection and datum is UTM Z11, NAD 83 with double precision accuracy maintained throughout all processes.

GISmo Solutions Ltd. used data provided by the Base Features Project, Resource Data Branch and Alberta Sustainable Resource Development.

The general information, including this data set description document, is located in the OVERVIEW sub-directory. This sub-directory also contains the Edson and Drayton Valley study area boundaries, and an ArcView project file allowing for easy display of provided information.

Weyer CDROM

The following directories and files are provided on the delivery CDROM:

**DEM, Detail_wsd, E00_ZIP, Hydrography, REF_ED_FACET,
Watersheds, BF_Edit, and Overview,**

DEM

This directory contains seamless source DEM coverage and some processed terrain information.

Specific files are as follows:

Ff_vey_enh	A hydrologically corrected "Fully filled" DEM provided as a seamless source data for study area.
vey_hsh	A hillshade grid created from the hydrologically adjusted surface with 35, 50 and 2 parameter values for sun location and vertical exaggeration.
Fpalin	A flow accumulation lines grid indicating patterns of flow on ff_vey_enh (used in the QC process for validation of hydro network). Grid has a 25 m resolution and 50 cells threshold.
Hc_vey_enh	A hydrologically corrected DEM enhanced with a 3m partial fill (for error reduction) provided as a seamless source data for study area.
Ppalin	A flow accumulation lines grid indicating patterns of flow on hc_vey_enh, Grid has a 25 m resolution and 50 cells threshold.
info	ARC/INFO directory required for binary data structures.

Detail_wsd

This directory contains a single line hydrography network for interim processes and watersheds from fully filled terrain.

- Sln_temp** A simplified single line stream network for the study area. Segmentation of arcs (by pseudo nodes) is reduced to lake features (secondary flow attachment nodes are retained). Additional attributes for flow accumulation are added.
- Wey_fwsd** Watershed drainage polygon coverage corresponding to filled terrain

E00_ZIP

This directory contains the following ARC/INFO e00 files:

- We_hydpol.e00**
- We_slnet.e00**
- Wey_wsd3.e00**
- Wey_wsd4.e00**

Hydrography

This directory contains corrected hydrography data originally delivered from the Base Features project. All data sets were provided as seamless coverages (E00) with unique BF-id identifiers. "WE" is a prefix that was assigned for the extended study area and used to create the hydro-corrected DEM.

- we_slnet** A seamless SDE extracted set of SLNET data from RDB Data Distribution.
- we_hydpol** Seamless SDE extracted set of Hydro Polygons from RDB Data Distribution.
- info** ARC/INFO directory required for binary data structures.

Ref_ED_FACET

This directory contains reference class 3 and class 4 watersheds that were created by Facet for the Foothill Model Forest in the Edson area. These datasets were assembled by GISmo from the delivery detailed shape polygon coverages by extracting and combining sub-basins of class 3 and higher (Ed_wsd3) and class 4 and higher (Ed_wsd4).

Ed_wsd3 Watersheds of Class 3 supplemented by components of higher class watersheds for Edson area (with partial overlap to DV area)

Ed_wsd4 Watersheds of Class 4 supplemented by components of higher class watersheds for Edson area (with partial overlap to DV area)

Info ARC/INFO directory required for binary data structures.

Watersheds

This directory contains the delineated watershed polygon coverages created by GISmo Solutions Ltd for the Edson and Drayton Valley Area. These dataset represent sub-basins of class 3 and higher (wey_wsd3) and class 4 and higher (wey_wsd4). These basin boundaries were created using a hydro-corrected DEM and an ARC/INFO watershed delineation processes.

Wey_wsd4 Watersheds of Class 4 supplemented by components of higher class Watersheds for Weyerhaeuser study area (Drayton Valley and Edson)
Individual watersheds have preliminary unique names.

Wey_wsd3 Watersheds of Class 3 supplemented by components of higher class Watersheds for Weyerhaeuser study area (Drayton Valley and Edson)
Individual watersheds wsd4 names and unique internal counters for future construction of final names.

Info ARC/INFO directory required for binary data structures.

BF_EDITS

This directory contains coverages and database tables (.dbf format) indicating significant changes to the Base Features repository information. These changes represent required adjustments to the original Base Features datasets as validated by the data authorities. A complete list of features that have other minor attribute changes required to construct proper routes or to obtain a desired functionality (i.e. simplification of braiding patterns of primary /secondary flows) is also provided.

Specific files are as follows:

- BF_MOD_DEL** Coverage with deleted Base Features elements (if required) Examples of such elements on other data sets are features that required spatial modification (i.e. split or extension) except for flipped elements where BF-id is not changed, all spatially modified elements will have a deleted feature in BF_MOD_DEL and corresponding added feature(s) in BF_MOD_ADD coverage.
- BF_MOD_ADD** Coverage with added features (if required) Examples of such elements on other data sets are spatially modified features corresponding to the deleted elements and features that were added following data authorities instructions. Stream or lake representation lines may be added to connect flows to main stream network.
- BF_FLIP** Coverage contains arcs that required flow directionality change (i.e original data is incorrectly directed upstream). A number of lake flow representation lines belong to this category. To find these features in the corresponding Single Line Network SLNET, elements have the bf_edit attribute set to "flip".
- BF_MISC** Coverage contains elements with important changes to the critical Base Features attributes. The key changes represented in this dataset are name attribute changes and major Primary/ Secondary flow updates.
- Note: The PS_flow BF attribute is never changed. Updates to a primary/secondary flow designations are stored in SEC_SEG attribute.*

BF_EDITS.dbf

This table contains a list of BF_IDs for all features that were modified (i.e . edits change the value of Base Features attributes) and have defined edit detail information. Edits to most of these elements are not related to enforcing of Base Features standard, but rather to providing additional functionality.

Examples are:

To allow for simplification of watersheds in braided stream area some elements are reset to secondary flows (edit_det = "miscoded P/S").

To allow for building of routes with a proper measure along streams (without starting segments in lakes and double line rivers) names are deleted or added to certain features (edit_det = "name del" or "name added").

Overview

This directory contains an outline of the study area, data documentation, and an ArcView 3.2 project for information display. Upon opening the ArcView 3.2 project, additional information about each View's data display can be found in the View Properties Comment Field (located in the View Menu – Properties). These views are also discussed further in this document.

Specific files are as follows:

dv_bdy Drayton Valley study area boundary.

ed_bdy Edson study area boundary.

Wey_watersheds_des.doc Microsoft WORD file, data description document.

Wey_watersheds.apr An ArcView 3.2 project providing data overview.

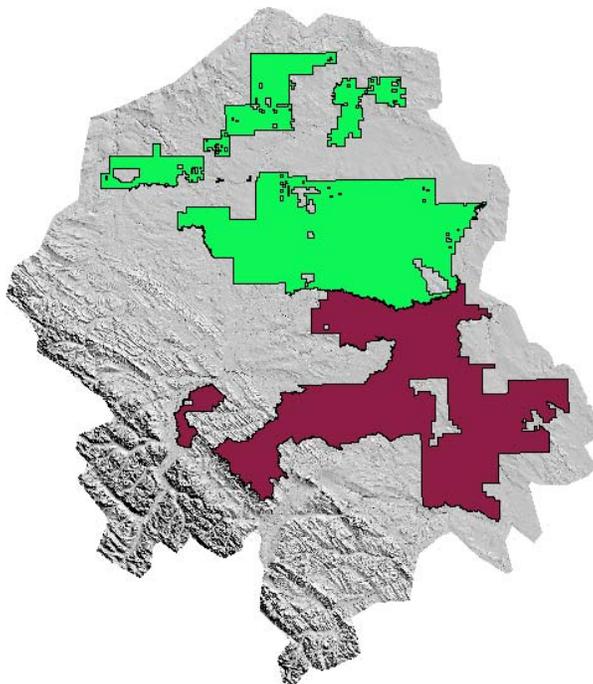
Visio diagrams

Process/Entity documentation

The following views are provided in the **wey_watersheds.apr** project for client's reference:

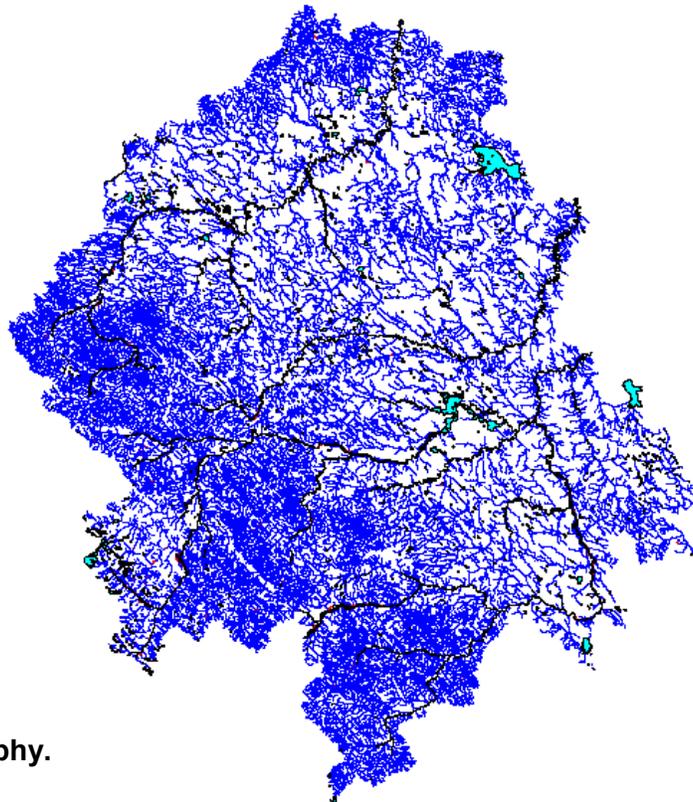
01 Overview.

This view provides an overview of the Weyerhaeuser Study Area:
Drayton Valley – Red, Edson – Green.



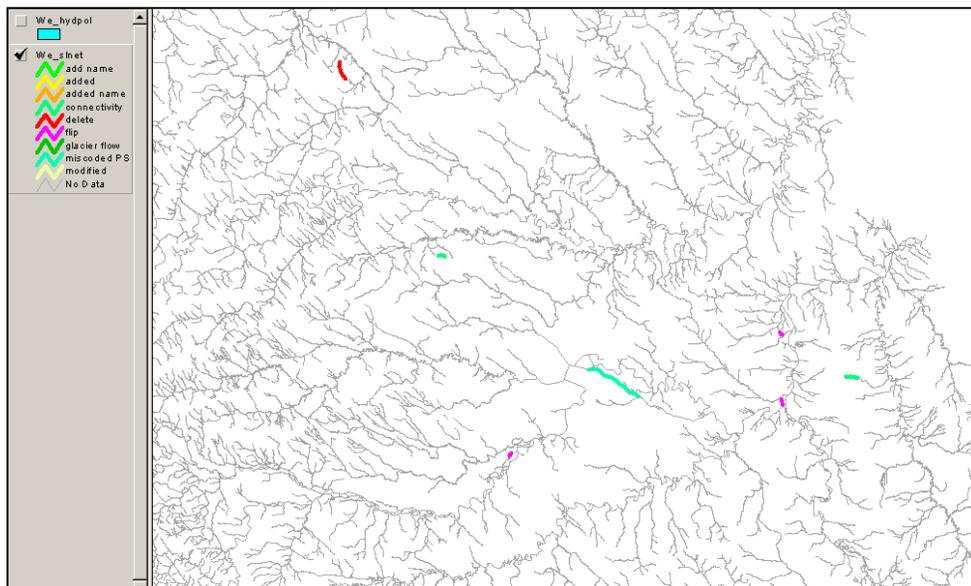
02 Hydrography.

This view shows an overview of the source Base Features Data: the Single line stream network with primary and secondary flows.



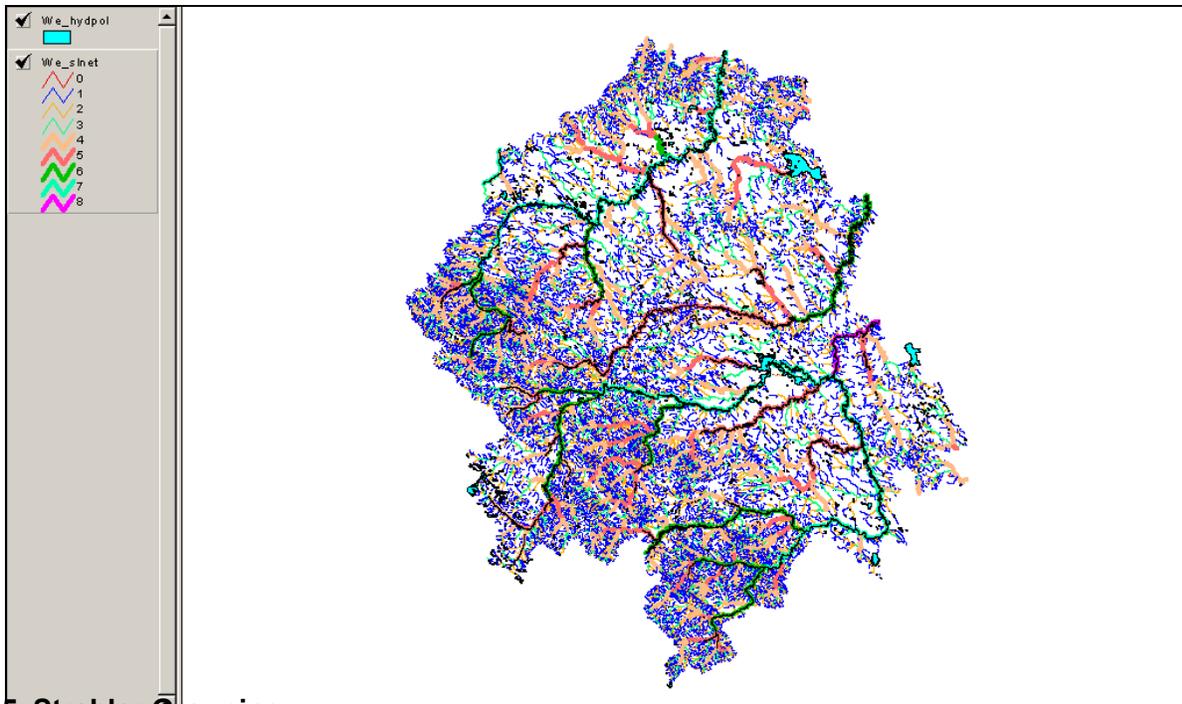
03 Validation of Hydrography.

Depicted here are some examples of locations where corrections were suggested on the single line stream network. Such corrections include miscoded data and flipped flows. To find these locations in the we_slnet dataset, display by attribute EDIT_DET.



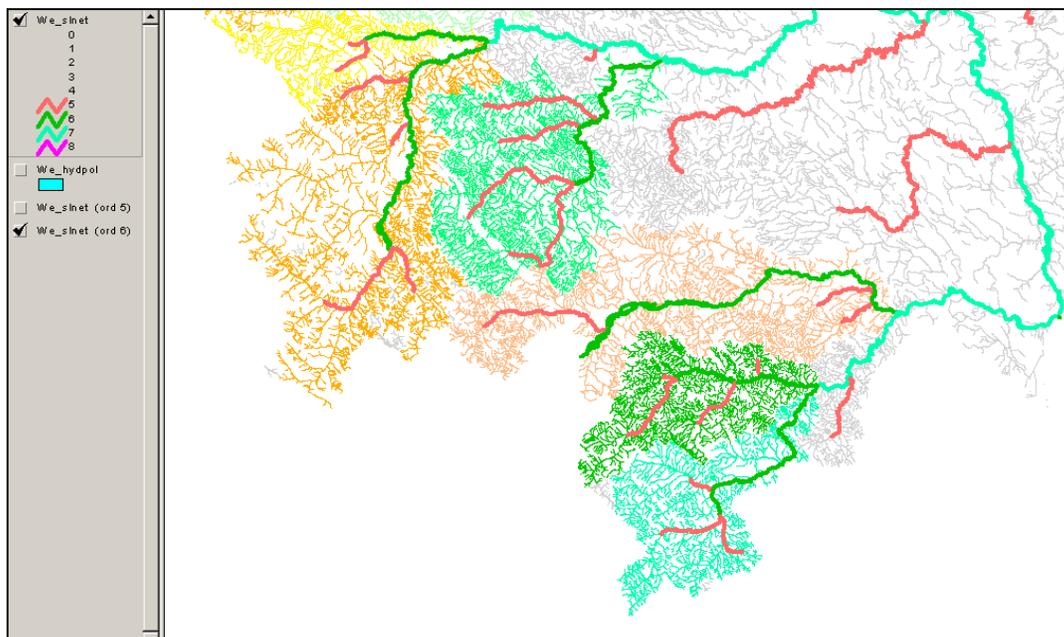
04 Strahler Classification

In this view, both streams and corresponding watershed polygons have Strahler order and grouping attributes. For example an ORD4 grouping attribute identifies a unique class 4 stream (last arc) that is draining a given area.



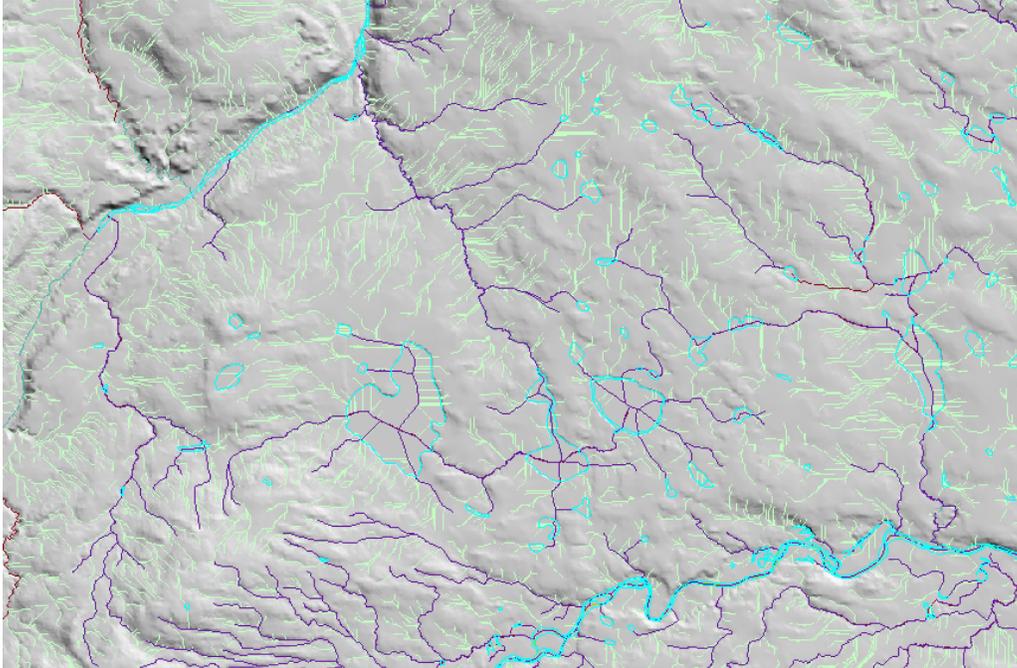
05 Strahler Grouping

Here, both streams and corresponding watershed polygons have Strahler order and grouping attributes. For example, ORD4 grouping attribute identifies a unique class 4 stream (last arc) that is draining a given area.



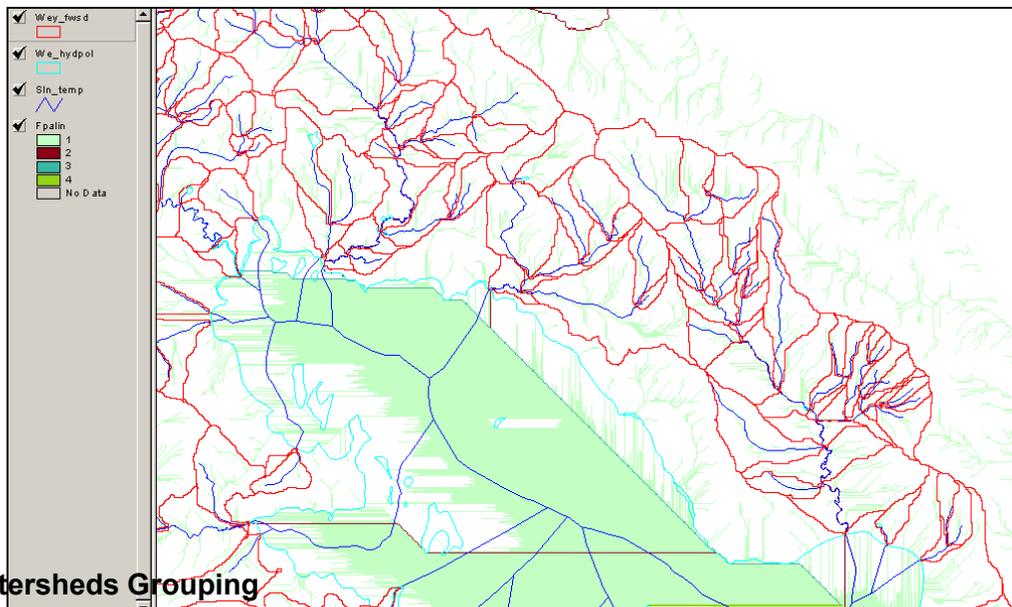
06 Hydro correction of DEM

This is a digital representation of terrain related to and reflecting hydrology features. Here, the generation of derived flow lines closely resembling hydrography data used in the adjustment process. This data was used for analysis and correction of the initial source DEM, slnet and hypopoly data.



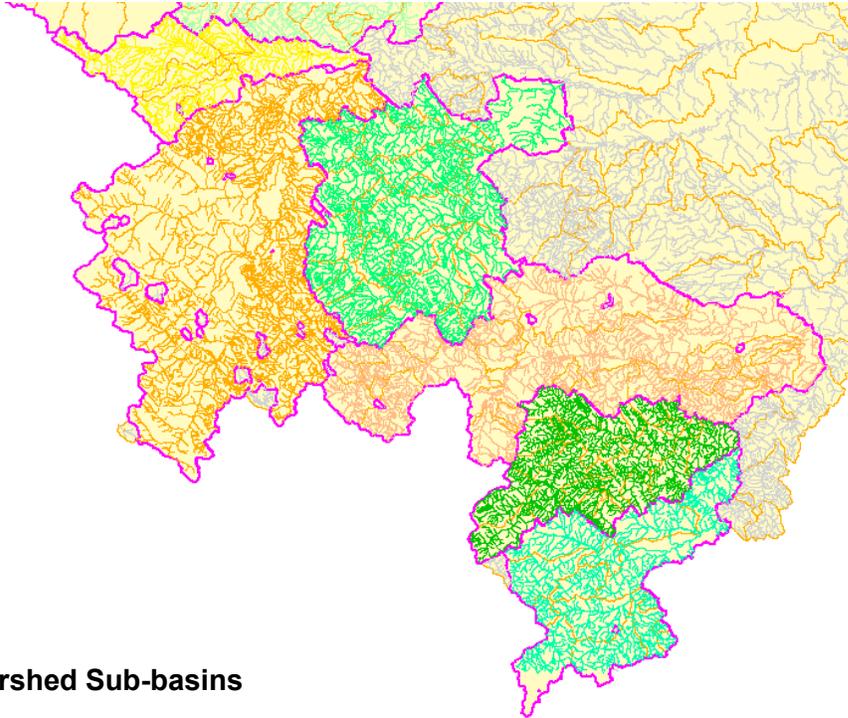
07 Detailed Delineation of Catchment Areas

This view shows the polygons of watershed drainage areas associated with individual arcs (from simplified network). Strahler classification and grouping attributes were transferred from the corresponding arcs.



08 Watersheds Grouping

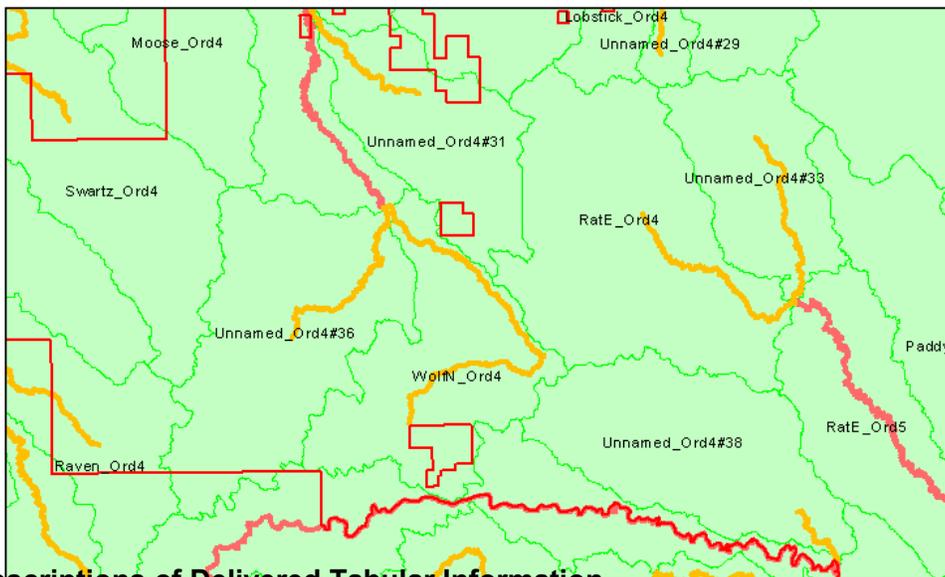
Displayed here, individual polygons of the detailed watershed coverage were grouped (into regions) as per Strahler order class and parent flow. Boundaries of class 6 regions correspond to class 6 hydrography sub-networks. Boundaries of class 4, 5, 6 and higher were used to assemble and attribute wey_wsd4 coverage, and boundaries of class 3, and higher were used to assemble wey_wsd3 coverage.



09 Naming Watershed Sub-basins

Sub-basin names were constructed from main stream or river and corresponding Strahler class.

There were a number of unnamed class 3 and 4 sub-basins and some duplicated stream names (eg. RatCreek, Crooked Creek). Upon two sessions with Weyerhaeuser representative Paul Scott, names were clarified, and where necessary, some names were redefined.



Detailed Descriptions of Delivered Tabular Information

The following details item descriptions for attributes found in delivery datasets:

WE_SLNET.AAT

NAME	ITEM DEFINITION	ITEM DESCRIPTION
FNODE#	4 5 B	From-node sequence number.
TNODE#	4 5 B	To-node sequence number.
LPOLY#	4 5 B	Left polygon sequence number.
RPOLY#	4 5 B	Right polygon sequence number.
LENGTH	8 18 F5	Length in coverage units.
WE_SLNET#	4 5 B	Arc internal sequence number (record number).
WE_SLNET-ID	4 5 B	Arc feature identification.
FEATURE_CODE	10 10 C	Base Features Project Attributes (BFA).
FEATURE_TYPE	30 30 C	BFA
NAME	80 80 C	BFA
SOURCE	6 6 C	BFA
CAPTURE_DATE	8 10 D	BFA
PS-FLOW	1 1 C	BFA
BF_ID	8 16 F3	Base Features identification
SEC_SEG	1 1 C	Secondary Segment flag "P", "S". If BF data was not changed in the QC process it corresponds to PS-FLOW attribute.
BF_EDIT_FL	1 1 I	Flag from correction process values
EDIT_DET	15 15 C	Edit detail – description corresponding to BF_EDIT_FL: Add Name Added Added Name Connectivity Delete Flip Glacier Flow Miscoded PS (Primary/Secondary) Modified No Data
STRAL_PF	8 7 F	Strahler class for primary flows only
STARTORDER	2 6 B	Attribute controlling classification for external inflows
STRORDER	2 6 B	Strahler class (1 - 8 in this set).
ST_NROU	2 2 B	Flag to start a construction of a new route in unnamed double line channels
ERRORS	20 20 C	Error messages from initial route creation (name and P/S errors)
STARTLENGTH	4 8 B	Attribute allows for adjusting route construction priority on inflowing streams
SEG_NO	4 6 B	Sequential upstream segment number (route design attribute)
HI_ORD	4 6 B	Highest Strahler order (route design attribute)
DOM_NU	4 6 B	Route ID (route design attribute)

DOM_ID	4	6	B	Route ID of corresponding primary route (route design att. on S flow)
NEWROUTFLAG	2	1	B	New Route required flag (route design attribute)
NEW_ROUTE	2	2	I	New Route required flag (set by operator) 1 start new route on primary fork. 2 new route allowing for flow continuation where new name introduced. Attribute controls accumulation through the network
ORD8	4	5	B	Strahler order 8 grouping attribute
ORD7	4	5	B	Strahler order 7 grouping attribute
ORD6	4	5	B	Strahler order 6 grouping attribute
ORD5	4	5	B	Strahler order 5 grouping attribute
ORD4	4	5	B	Strahler order 4 grouping attribute
ORD3	4	5	B	Strahler order 3 grouping attribute
ORD2	4	5	B	Strahler order 2 grouping attribute
ORD1	4	5	B	Strahler order 1 grouping attribute

SLN_TEMP.AAT

NAME	ITEM DEFINITION	ITEM DESCRIPTION
FNODE#	4 5 B	From-node sequence number.
TNODE#	4 5 B	To-node sequence number.
LPOLY#	4 5 B	Left polygon sequence number.
RPOLY#	4 5 B	Right polygon sequence number.
LENGTH	8 18 F 5	Length in coverage units.
SLN_TEMP#	4 5 B	Arc internal sequence number (record number).
SLN_TEMP-ID	4 5 B	Arc feature identification.
SLN_POU	4 6 B	
BF_ID_LK	8 16 F 3	BF_ID link to most downstream BF feature related to simplified stream and corresponding catchment polygon
NEW_ROUTE	2 2 I	New Route required flag (set by operator) 1 start new route on primary fork. 2 new route allowing for flow continuation where new name introduced. Attribute controls accumulation through the network
CNT_BF_ID	8 16 F3	BF_ID of a controlling segment in multi segment lake or riv.channel
DISS_BF_ID	8 16 F3	BF_ID of a controlling segment to be used in dissolve process
FEATURE_TYPE	30 30 C	Base Features Project Attributes (BFA).
ORG#	4 5 B	Arc internal sequence number of original sln_temp before any edits.

WEY_FWSD.PAT

NAME	ITEM DEFINITION	ITEM DESCRIPTION
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	N	
AREA	8 18 F5	Polygon area in coverage units. Set to 0 for point features
PERIMETER	8 18 F5	Perimeter in coverage units Set to 0 for point features
WEY_FWSD#	4 5 B	Polygon sequence number (record number).
WEY_FWSD-ID	4 5 B	Polygon feature identification.
GRID_CODE	4 8 B	Base Features Project Attributes (BFA).
STRORDER	4 5 B	Strahler class (1 - 8 in this set).
ORD8	4 5 B	Strahler order 8 grouping attribute
ORD7	4 5 B	Strahler order 7 grouping attribute
ORD6	4 5 B	Strahler order 6 grouping attribute
ORD5	4 5 B	Strahler order 5 grouping attribute
ORD4	4 5 B	Strahler order 4 grouping attribute
ORD3	4 5 B	Strahler order 3 grouping attribute
ORD2	4 5 B	Strahler order 2 grouping attribute
ORD1	4 5 B	Strahler order 1 grouping attribute

WEY_WSD3.PAT

NAME	ITEM DEFINITION	ITEM DESCRIPTION
AREA	8 18 F5	Polygon area in coverage units. Set to 0 for point features
PERIMETER	8 18 F5	Perimeter in coverage units Set to 0 for point features
WEY_WSD3#	4 5 B	Polygon sequence number (record number).
WEY_WSD3-ID	4 5 B	Polygon feature identification.
NEW_W_OR	16 16 I	
NEW_W_NAM	50 50 C	Sub-basin names constructed from main stream or river and corresponding Strahler class
NEW_STR	5 5 I	Corresponding Strahler class
NEW_W_NAM_3	40 40 C	Sub-basin names constructed from main stream or river, corresponding Strahler class and Unit number of class3 within class 4
CLIENT_NAME	40 40 C	Sub-basin names provided by client
FMA_OVERLAP	1 1 C	Flag indicating overlap with FMA

WEY_WSD4.PAT

NAME	ITEM DEFINITION	ITEM DESCRIPTION
AREA	8 18 F5	Polygon area in coverage units. Set to 0 for point features
PERIMETER	8 18 F5	Perimeter in coverage units Set to 0 for point features
WEY_WSD4#	4 5 B	Polygon sequence number (record number).
WEY_WSD4-ID	4 5 B	Polygon feature identification.
NEW_W_OR	16 16 I	
NEW_W_NAM	50 50 C	Sub-basin names constructed from main stream or river and corresponding Strahler class
NEW_STR	5 5 I	Corresponding Strahler class

CLIENT_NAME	40 40 C	Sub-basin names provided by client
FMA_OVERLAP	1 1 C	Flag indicated overlap with FMA