

**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:

|                   |                                                                                                                                                                                       |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Ff_vey_enh</b> | A hydrologically corrected "Fully filled" DEM provided as a seamless source data for study area.                                                                                      |
| <b>vey_hsh</b>    | A hillshade grid created from the hydrologically adjusted surface with 35, 50 and 2 parameter values for sun location and vertical exaggeration.                                      |
| <b>Fpalin</b>     | 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. |
| <b>Hc_vey_enh</b> | A hydrologically corrected DEM enhanced with a 3m partial fill (for error reduction) provided as a seamless source data for study area.                                               |
| <b>Ppalin</b>     | A flow accumulation lines grid indicating patterns of flow on hc_vey_enh, Grid has a 25 m resolution and 50 cells threshold.                                                          |
| <b>info</b>       | 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.

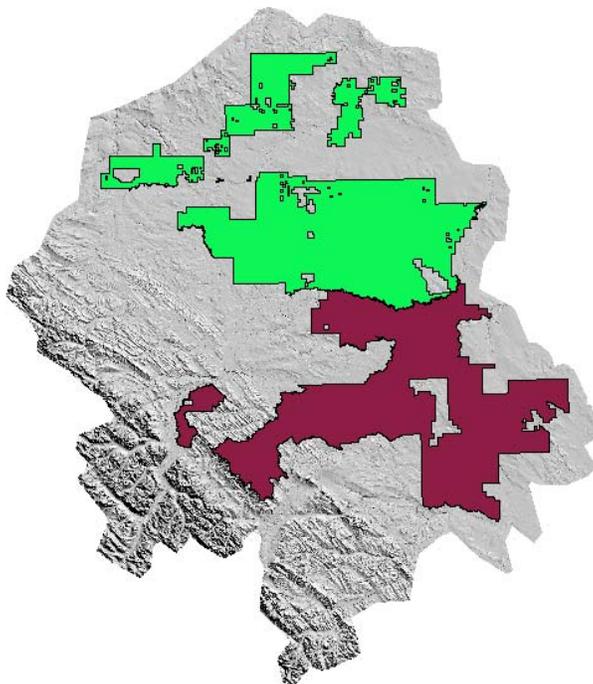
### Visio diagrams

### Process/Entity documentation

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

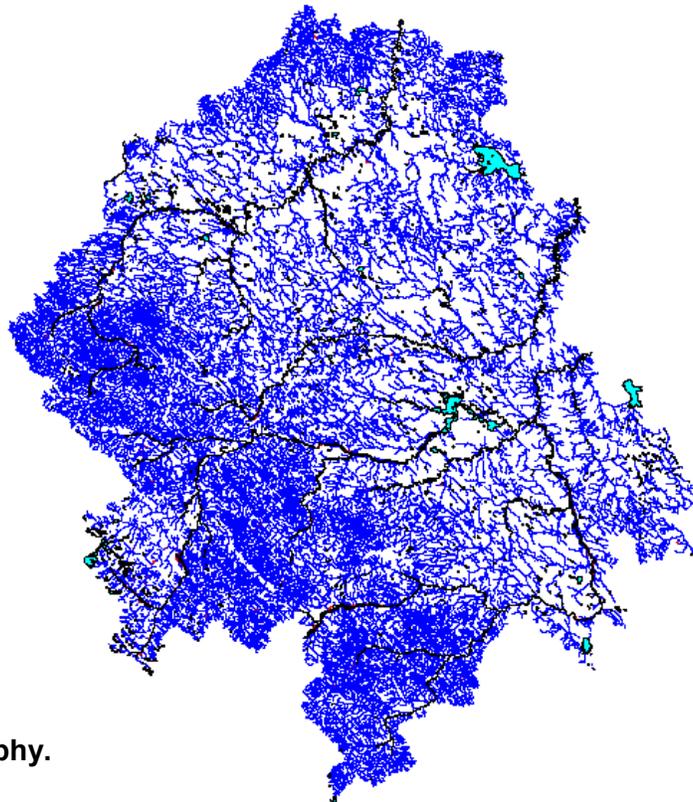
#### 01 Overview.

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



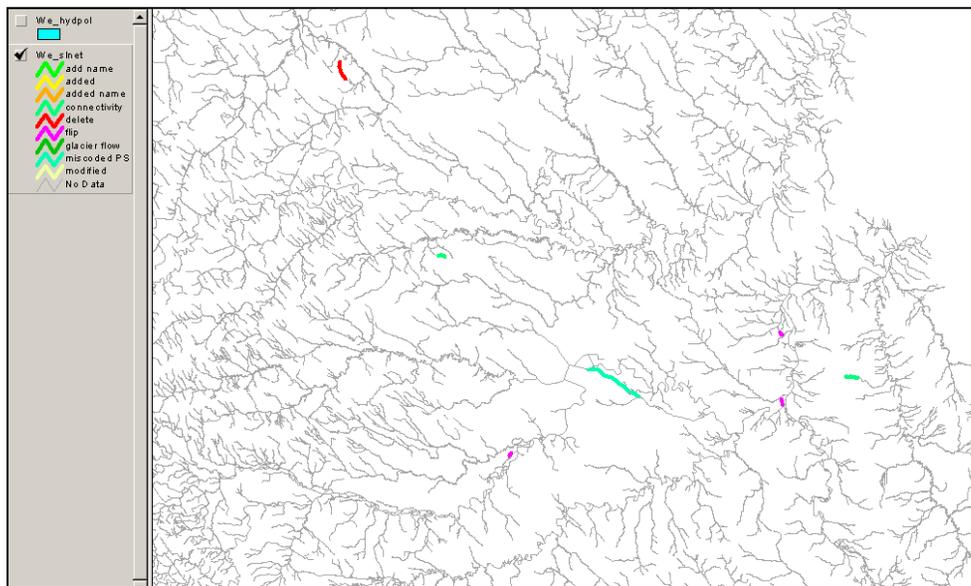
#### 02 Hydrography.

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



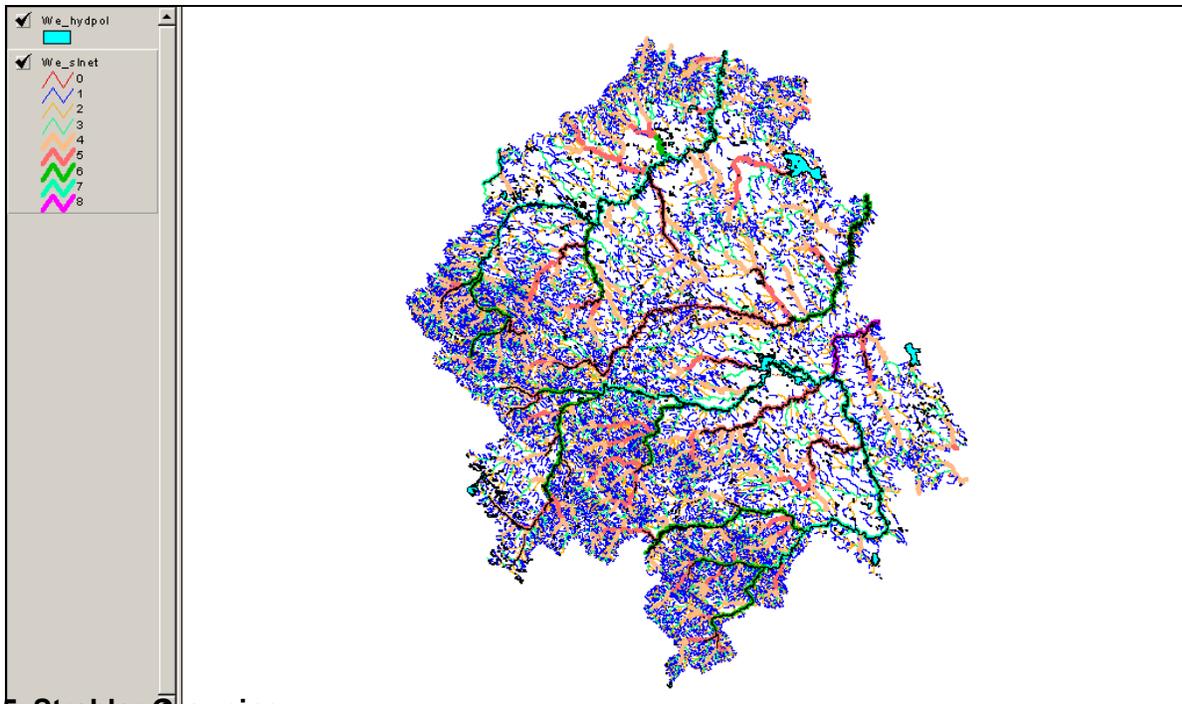
### 03 Validation of Hydrography.

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.



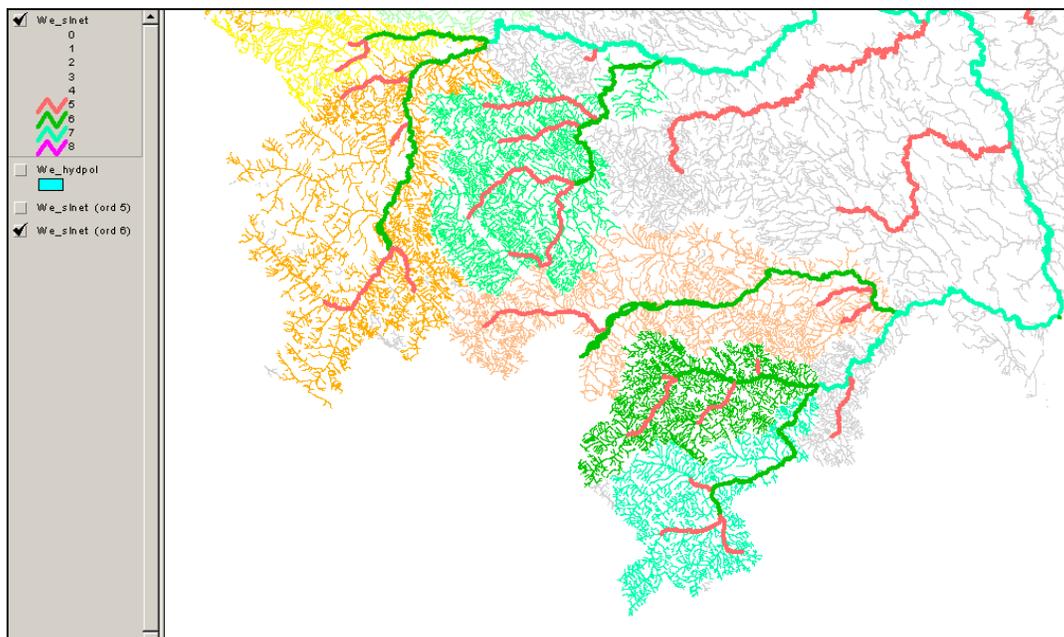
### 04 Strahler Classification

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.



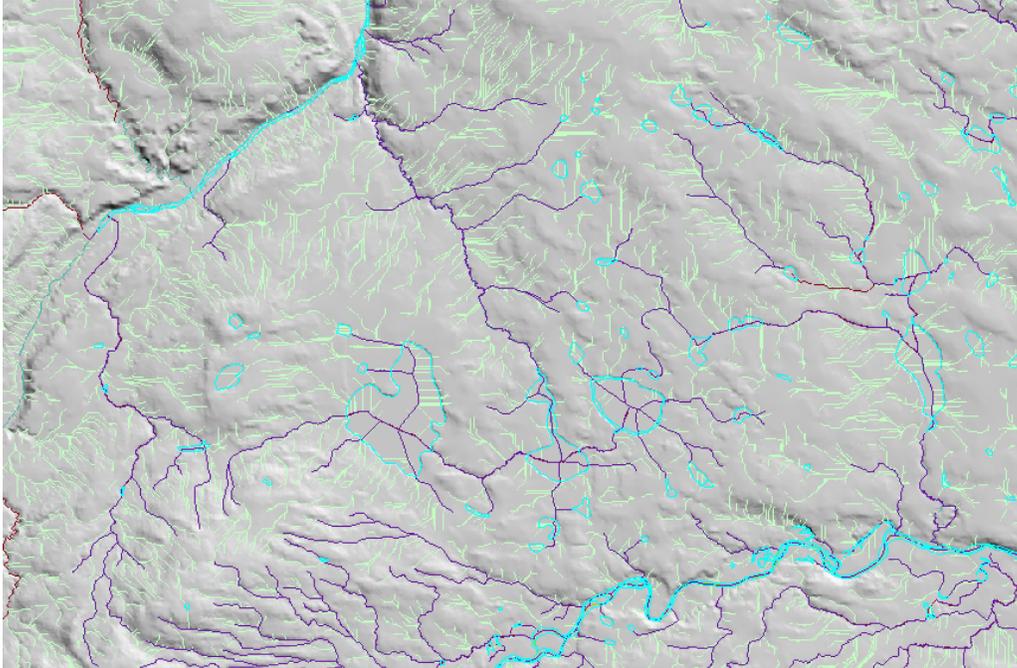
### 05 Strahler Grouping

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.



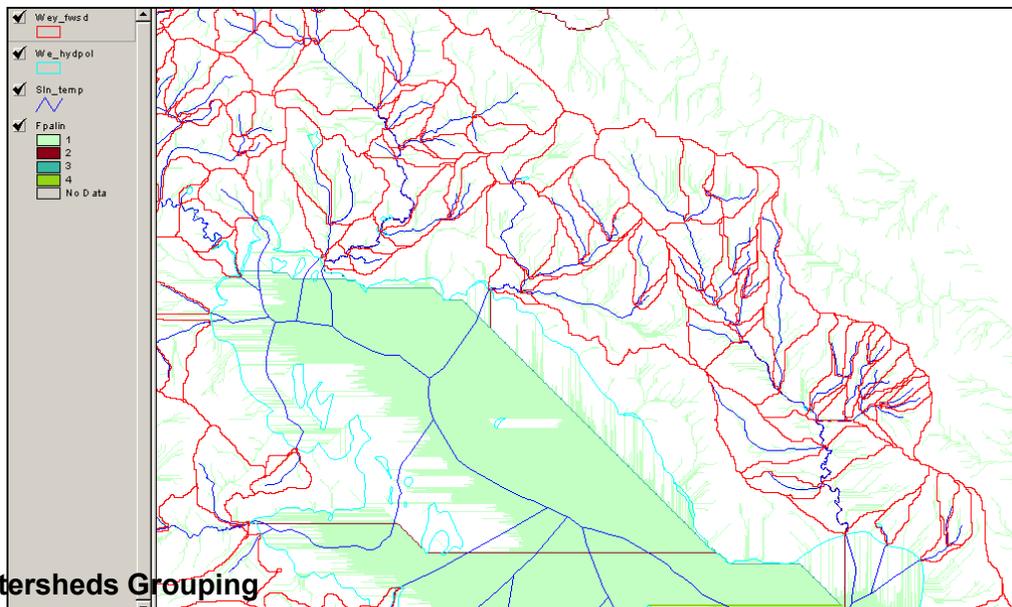
## 06 Hydro correction of DEM

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.



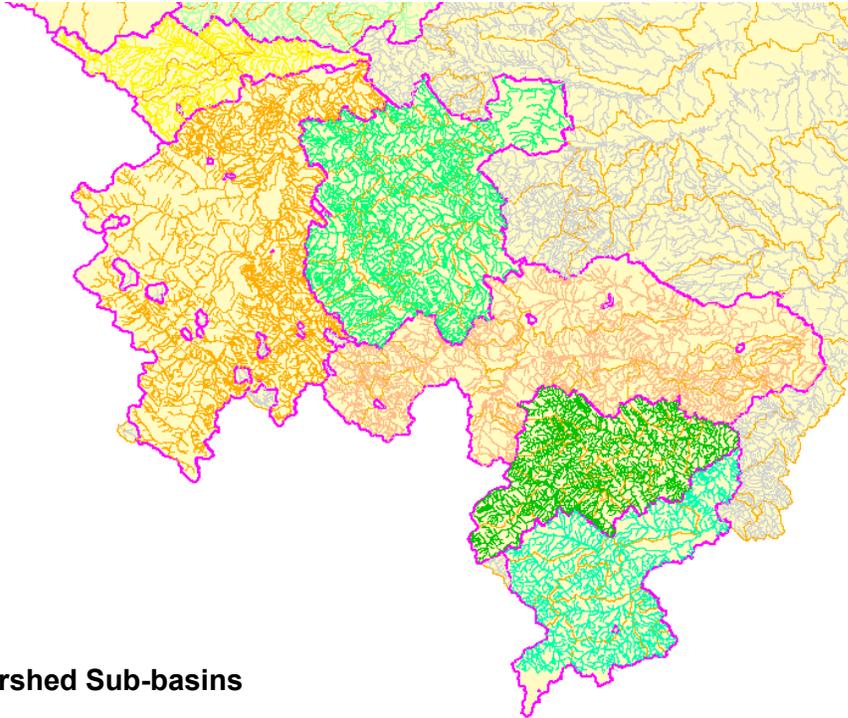
## 07 Detailed Delineation of Catchment Areas

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:<br>Add Name<br>Added<br>Added Name<br>Connectivity<br>Delete<br>Flip<br>Glacier Flow<br>Miscoded PS (Primary/Secondary)<br>Modified<br>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 F 3        | BF_ID of a controlling segment in multi segment lake or riv.channel                                                                                                                                    |
| DISS_BF_ID   | 8 16 F 3        | 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 |
|------|-----------------|------------------|
|------|-----------------|------------------|

|             | 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                                                           |

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