RECLAMATION

Managing Water in the West

Yakima Storage Study- Fisheries Assessment

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June 15, 2006

Ellensburg, Washington

U.S. Department of the Interior
Bureau of Reclamation

Study Goals

- **Improve fish habitat by restoring the flow regimes of the Yakima and Naches Rivers to more closely resemble the natural (unregulated) hydrograph.**

- Improve the water supply for proratable irrigation water rights in dry years by providing not less than 70% irrigation water supply during dry years at diversions subject to proration.

- Meet future municipal water supply needs by maintaining a full municipal water supply for existing users and providing additional surface water supply for population growth to the year 2050.

Introduction

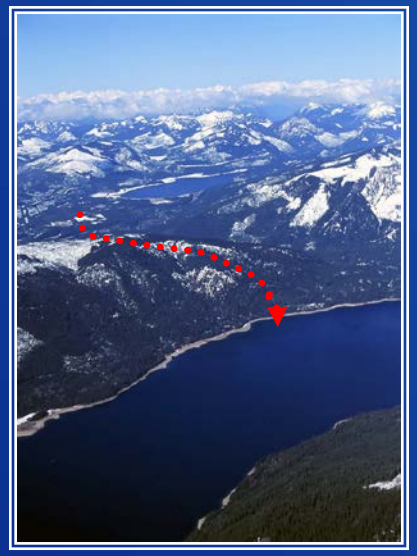
Current (no action) Operation Alternative = the way the river is currently operated following the guidelines of the Interim Comprehensive Operating Plan (November 2002).

Integrated 70% Operation Alternative = Bumping Lake enlargement, Keechelus-to-Kachess and Wymer reservoir alternatives were operated in an integrated manner.

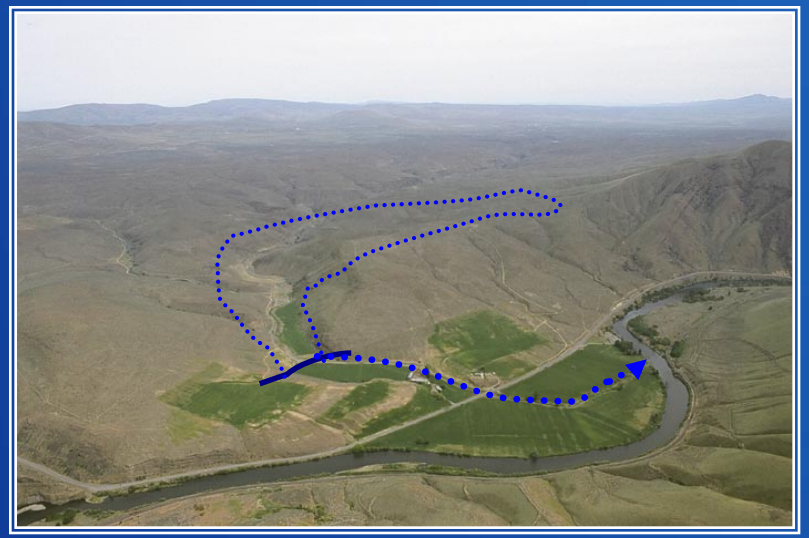
The irrigation object was to provide a 70% minimum of the prorated entitlements.

The fisheries object was to improve the overall Yakima basin flow regime.

Bumping Lake enlargement



Keechelus-to-Kachess pipeline



Wymer Dam & Reservoir

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Methods

The Riverware Hydrology Model:

- Provides a daily time-step of average river flow for several gage sites.
- A 23 year period of record (1981-2003) was used for each river discharge simulation.

The Indicator of Hydrologic Alterations Model:

The Nature Conservancy
SAVING THE LAST GREAT PLACES ON EARTH

- Parameters used in the analysis:
  1) median monthly flow (cfs)
  2) annual 1, 3, 7, 30, 90 day minimum & maximum flow (cfs)
  3) period (month) of peak & base flow.

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Yakima River Basin Storage Alternatives Appraisal Assessment

A component of
Yakima River Basin Water Storage Feasibility Study, Washington
Technical Series No. TS-YSS-8

Bumping Lake

Wymer Damsite

Keechelus-to-Kachess Pipeline

U.S. Department of the Interior
Bureau of Reclamation
Pacific Northwest Region

May 2006

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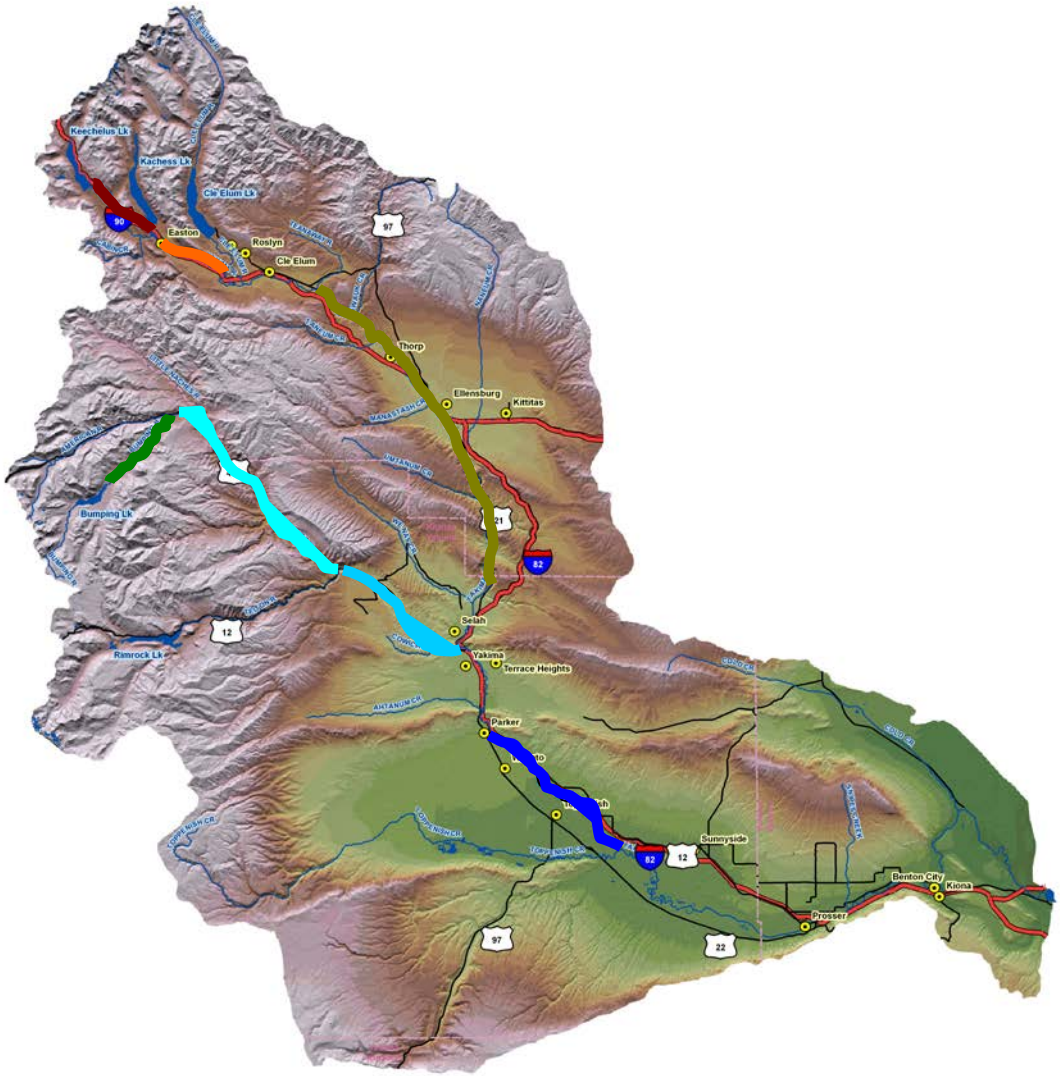
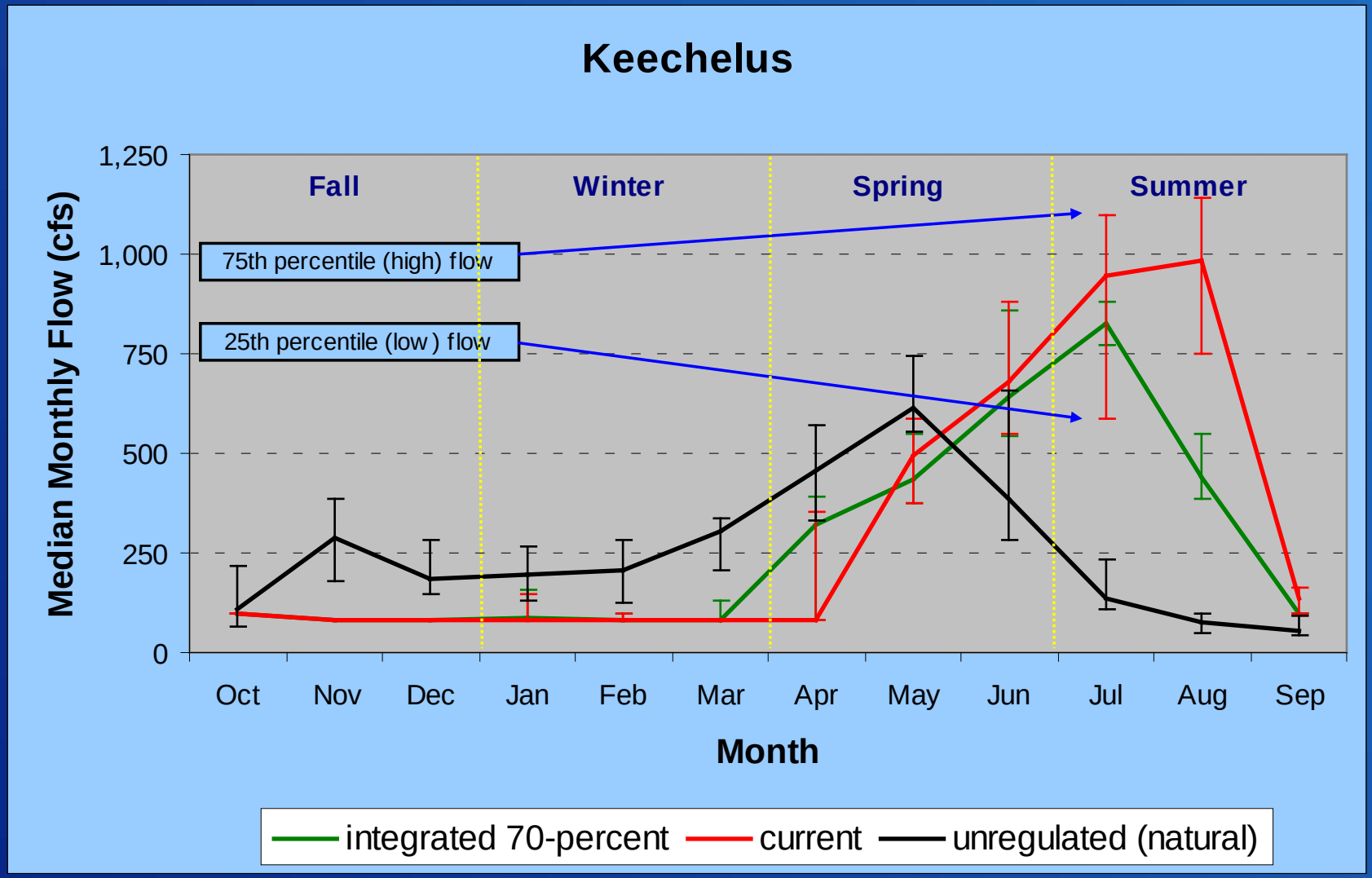
Results



- **7 river reaches were evaluated using the Riverware Model based on the following gage stations:**
  - Keechelus
  - Easton
  - Umtanum
  - Bumping Dam
  - Cliffdell
  - Naches at Naches
  - Parker



Keechelus gage:

- Flow regime was slightly improved.
  - Increase in the median April flow.
  - Decrease in the median July and August flow.

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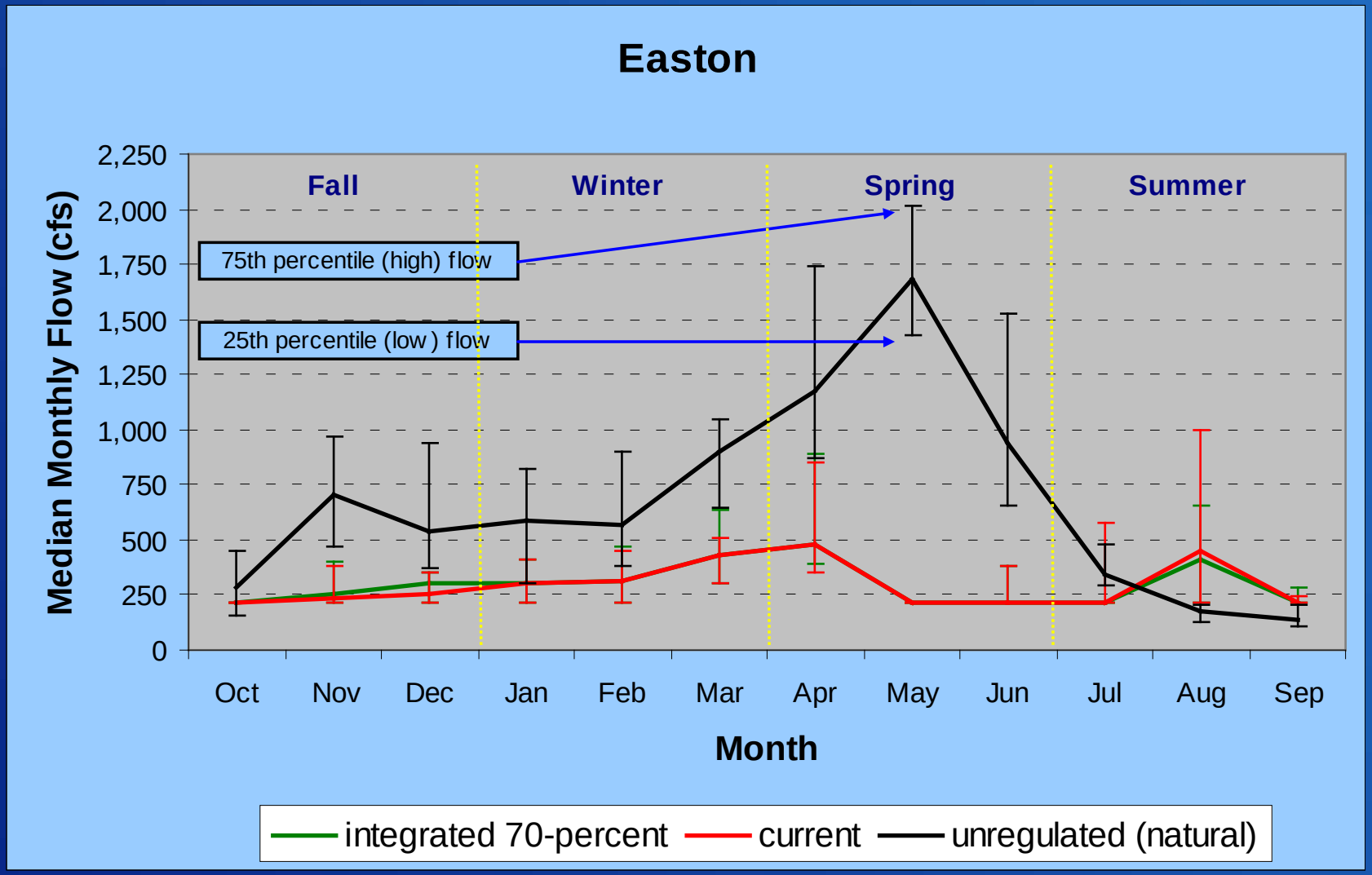

Easton gage:

- Flow regime remained essentially the same.

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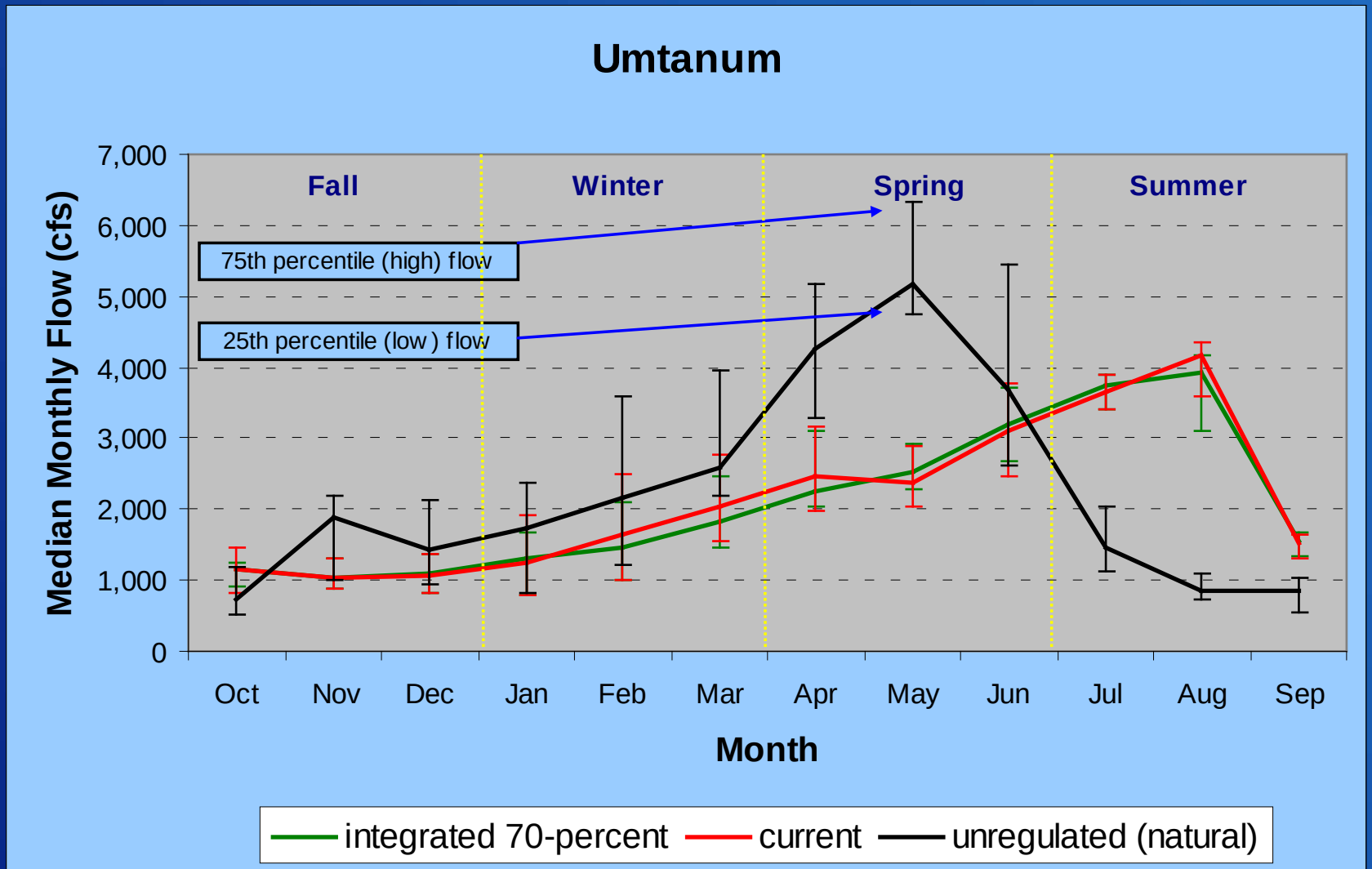

Umtanum gage:

- Flow regime remained essentially the same.

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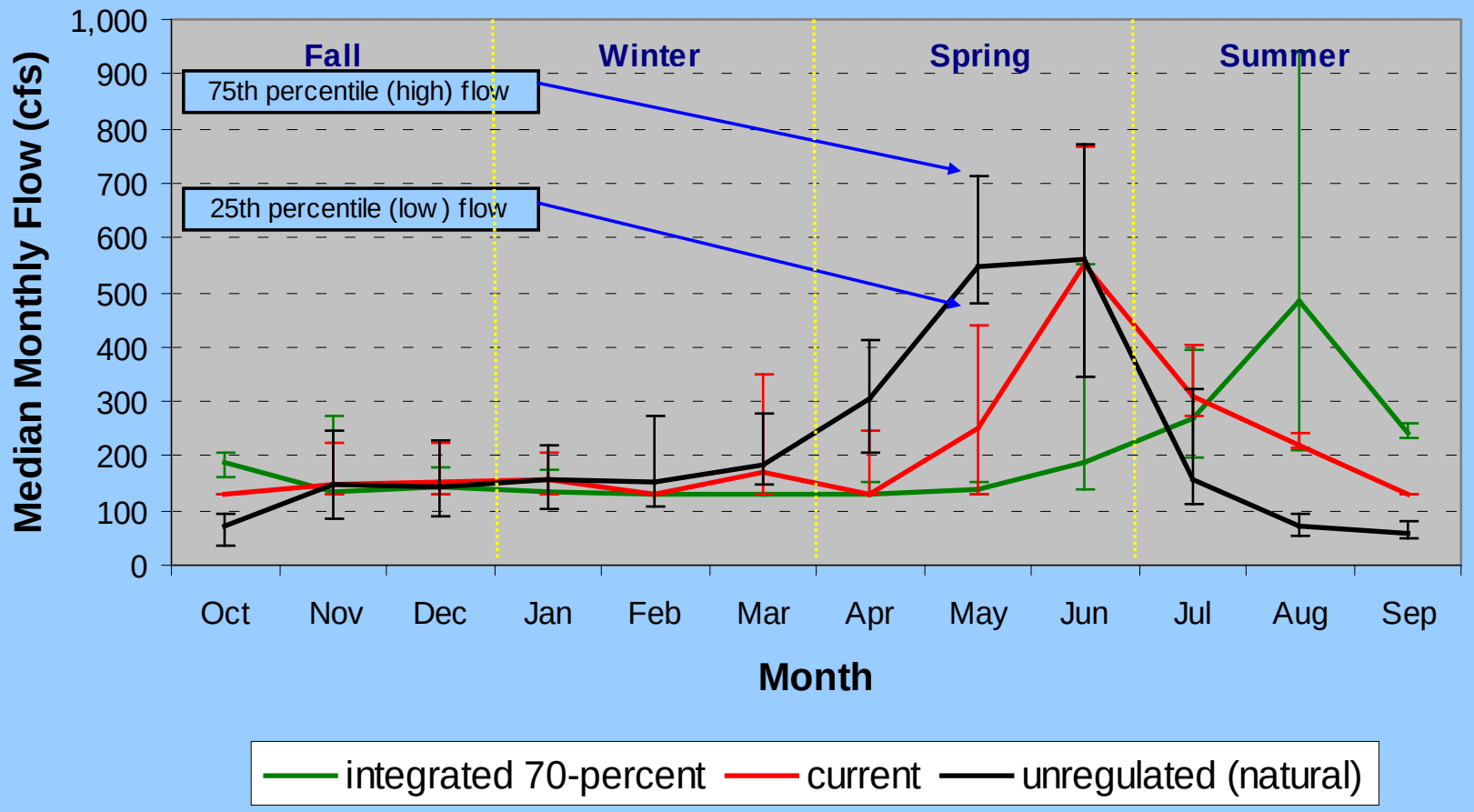
Bumping



Bumping Dam gage:

- Flow regime was substantially altered.
  - Spring flows significantly reduced.
  - Summer flows increased and created a “flip-flop” event.
  - Winter flows reduced.

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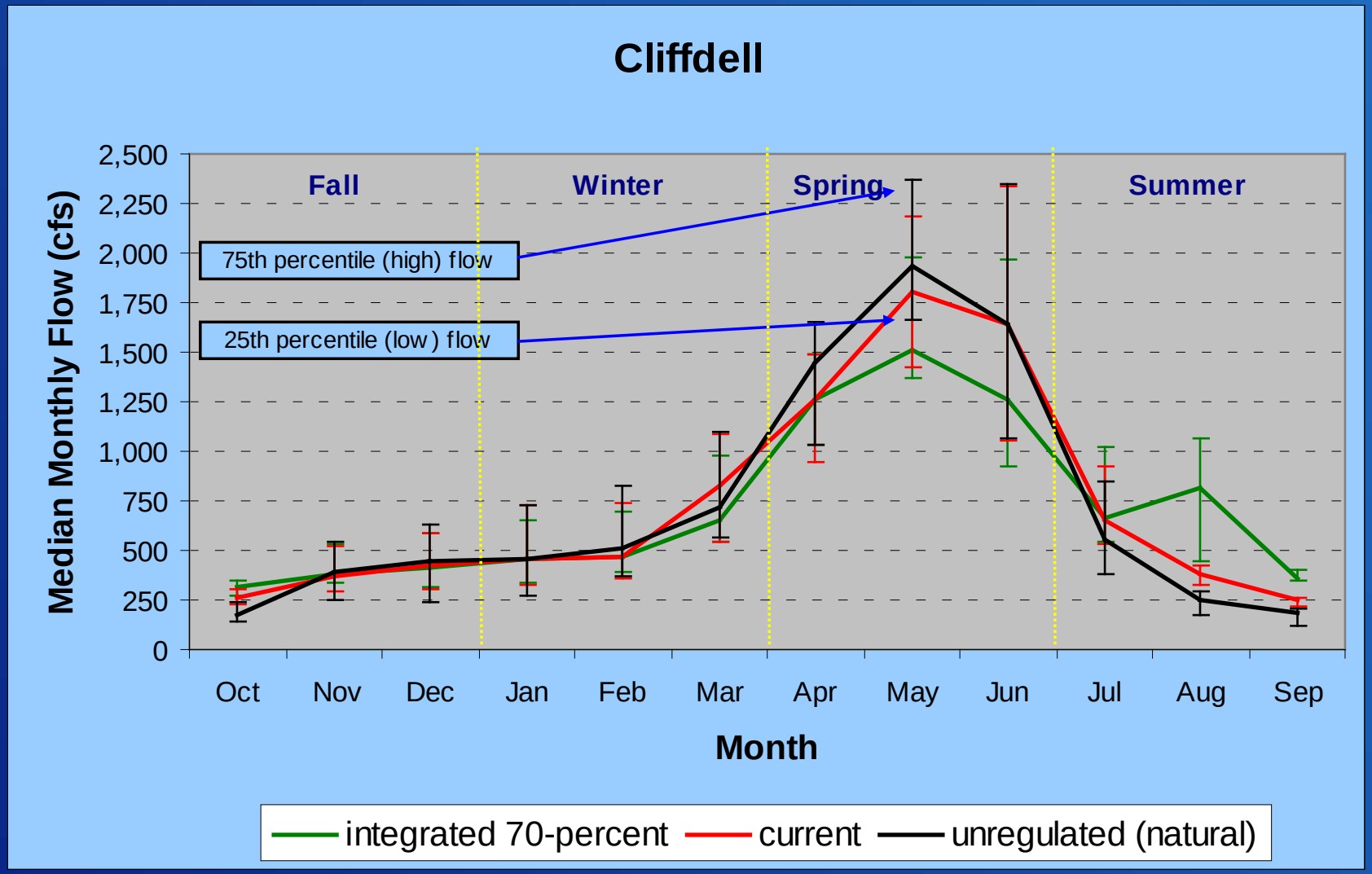

Cliffdell gage:

- Flow regime became less normative.
  - Spring flows decreased.
  - Summer flows increased and created a “flip-flop” event.

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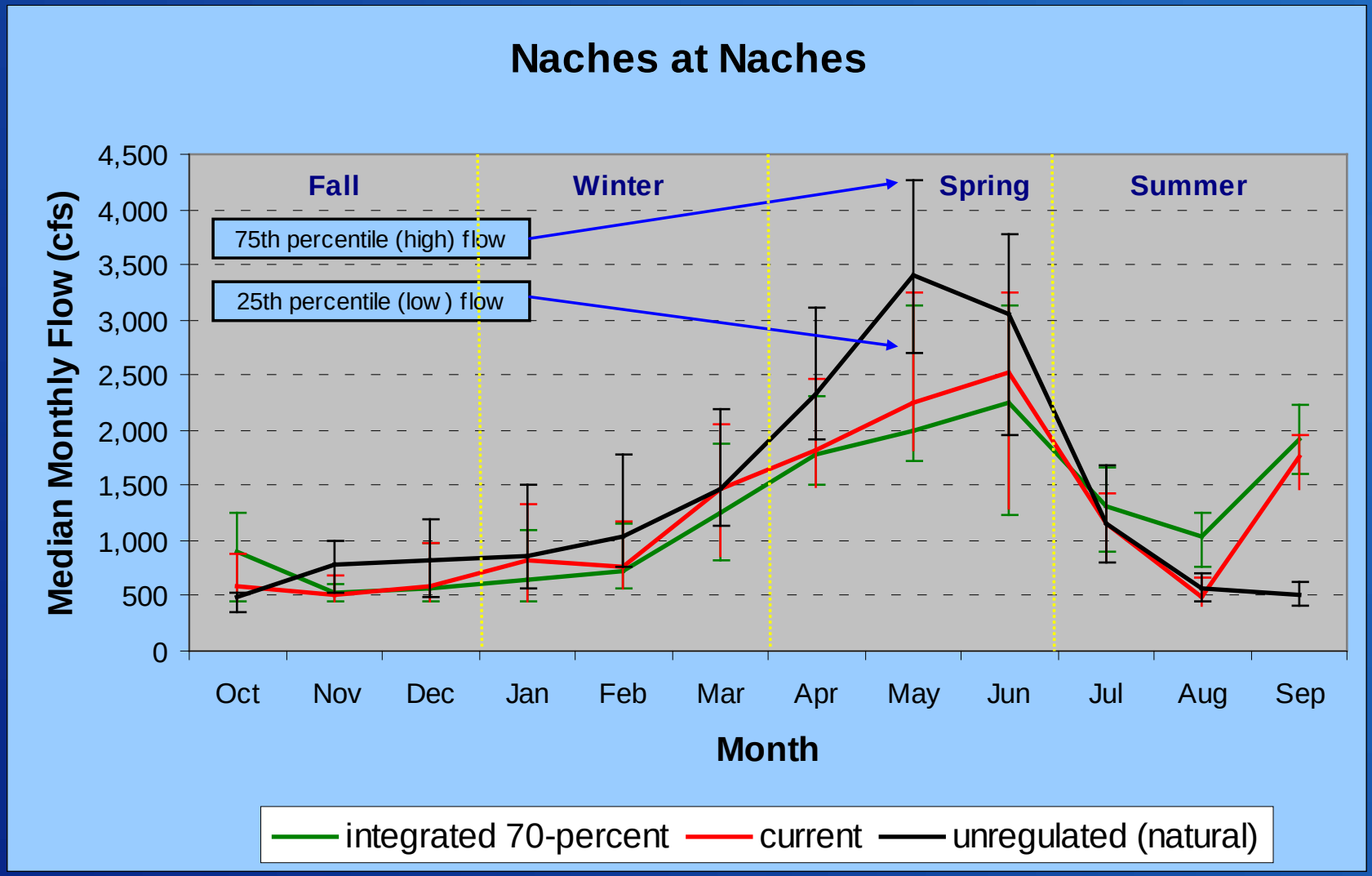

Naches at Naches gage:

- Flow regime less normative.
  - Spring flows decreased.
  - Summer flows increased and "flip-flop" continued to persist.

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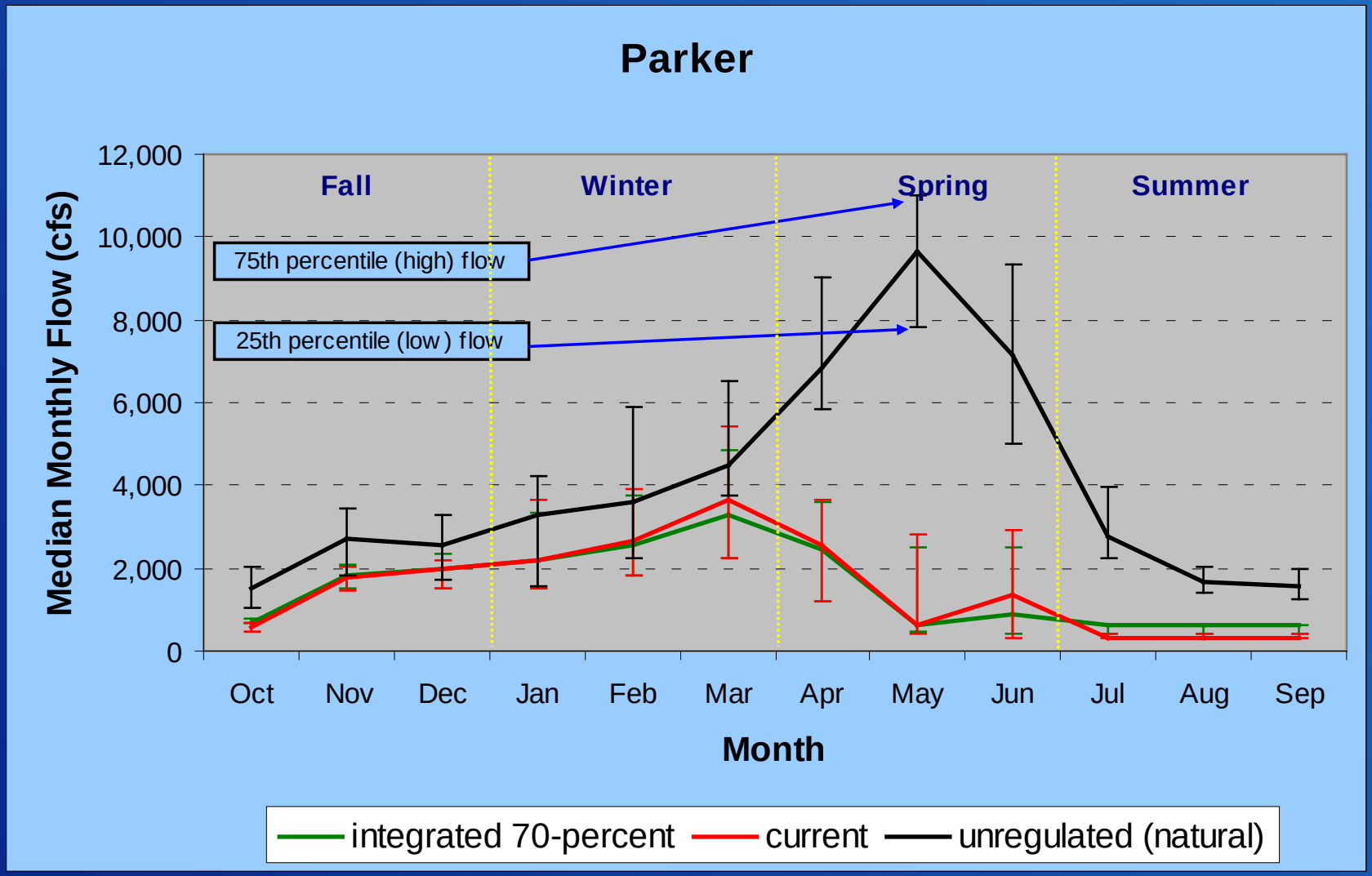

Parker gage:

- Flow regime remained essentially the same.
  - March and June flows were slightly lower.
  - Summer flows were somewhat higher.

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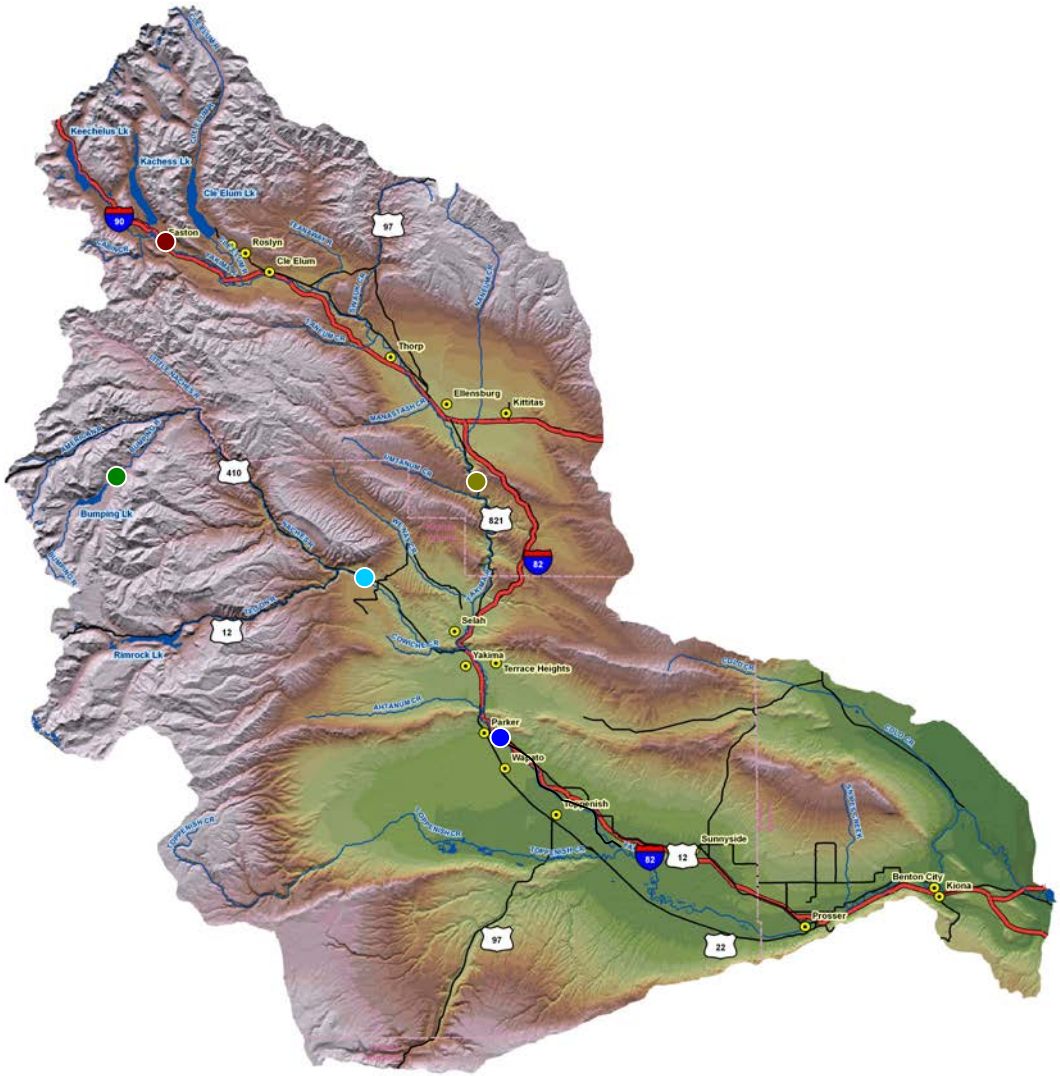
Results



- **5 river reaches were evaluated using the IHA Model based on the following gage stations:**
  - Easton
  - Umtanum
  - Bumping Dam
  - Naches at Naches
  - Parker

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Summary of hydrologic flow parameters comparing the integrated 70% operation scenario relative to the current operation scenario.

	Parameter	Easton	Umtanum	Bumping	Naches at Naches	Parker
Monthly Seasonal Flows	Spring	No Change	No Change	Worse	No Change	No Change
	Summer	No Change	No Change	No Change	Worse	No Change
	Fall	No Change	No Change	Worse	No Change	No Change
	Winter	No Change	No Change	Worse	No Change	No Change
Minimum & Maximum Flows	Minimum	No Change	Worse	Worse	Better	No Change
	Maximum	No Change	No Change	47% Worse & 47% Better	Worse	Worse
Peak & Base Timing						
	Peak Flow	No Change	No Change	Worse	No Change	No Change
	Base Flow	No Change	No Change	Worse	Worse	No Change

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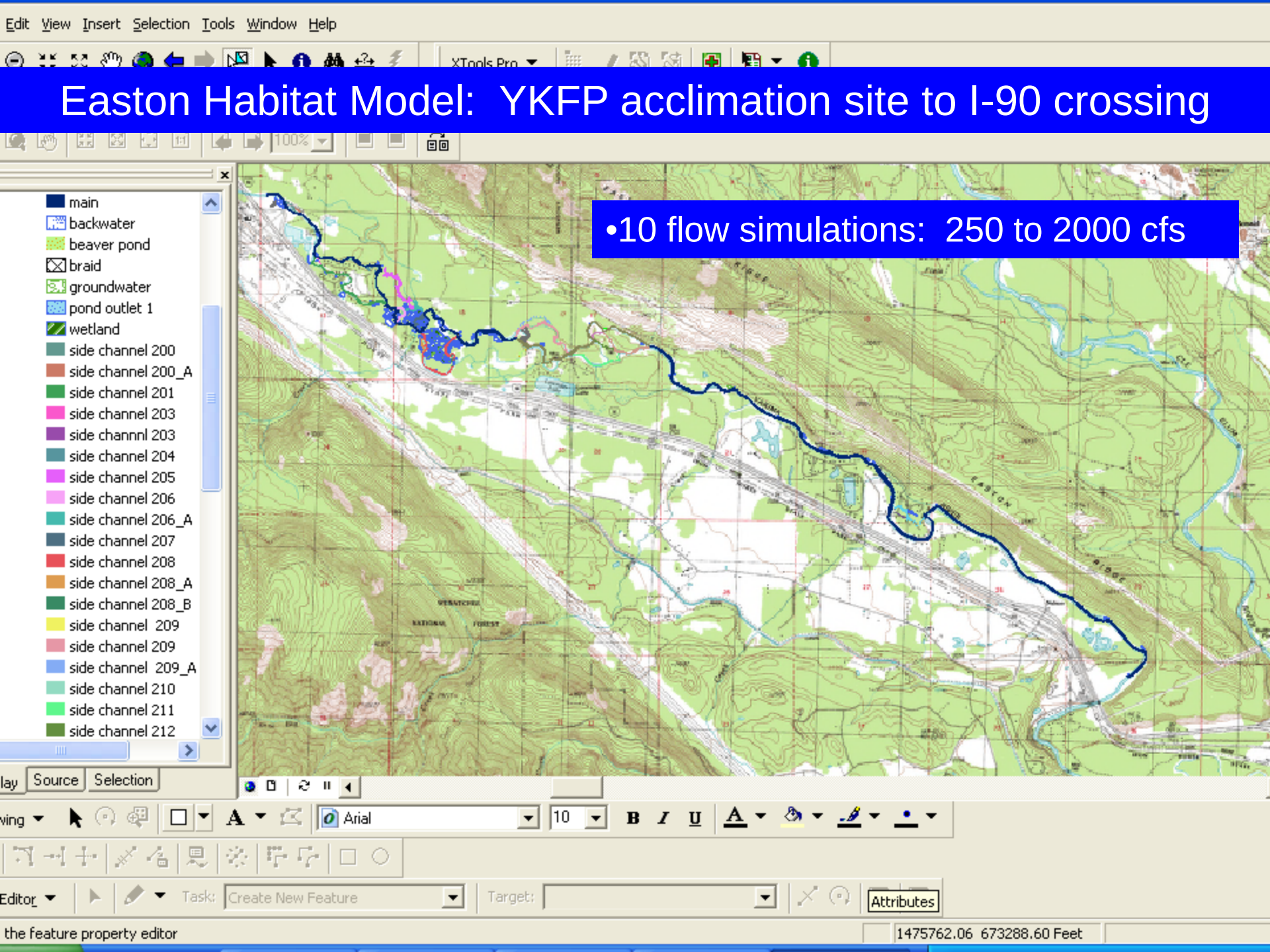
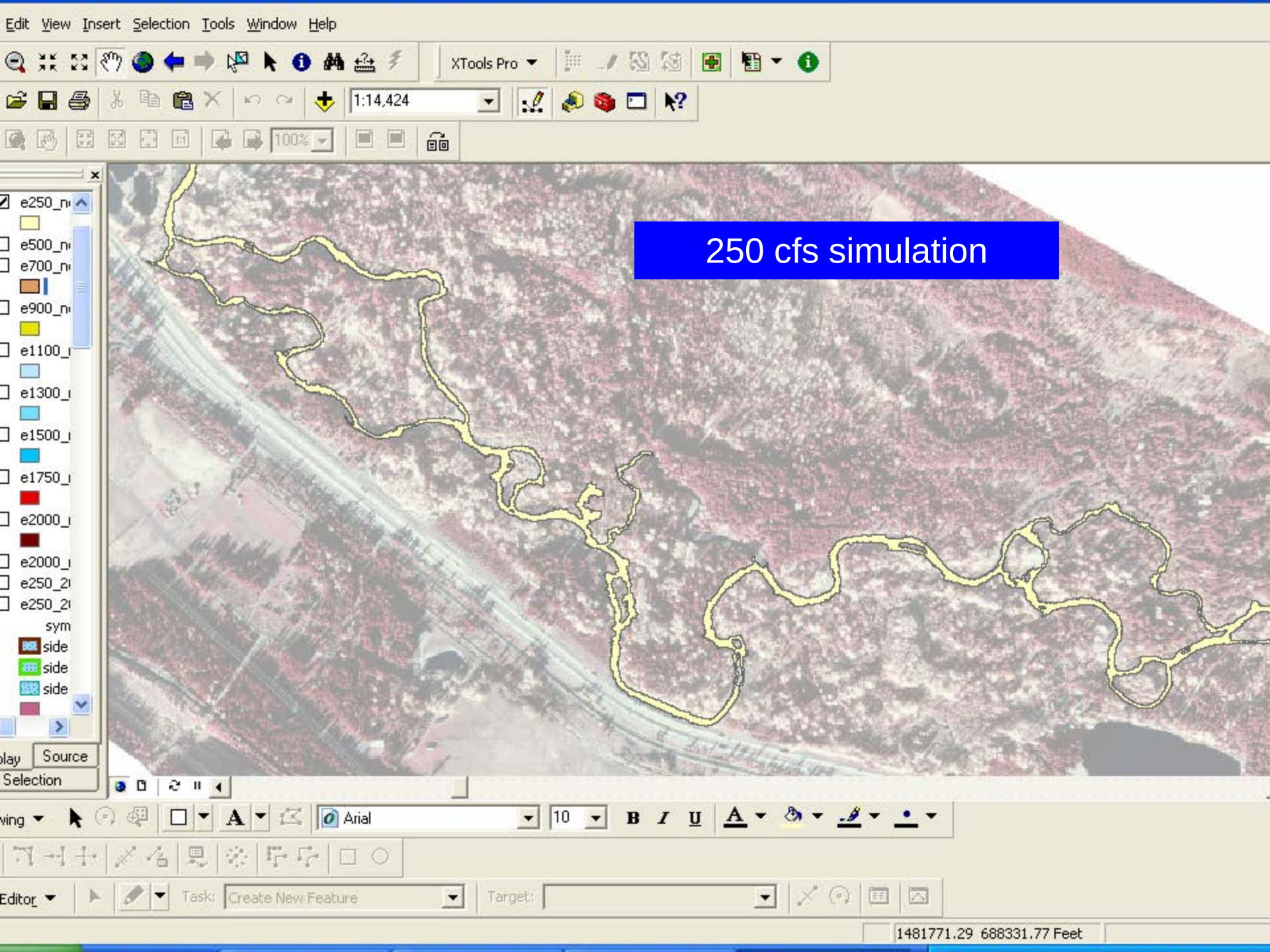
Easton Habitat Model: YKFP acclimation site to I-90 crossing

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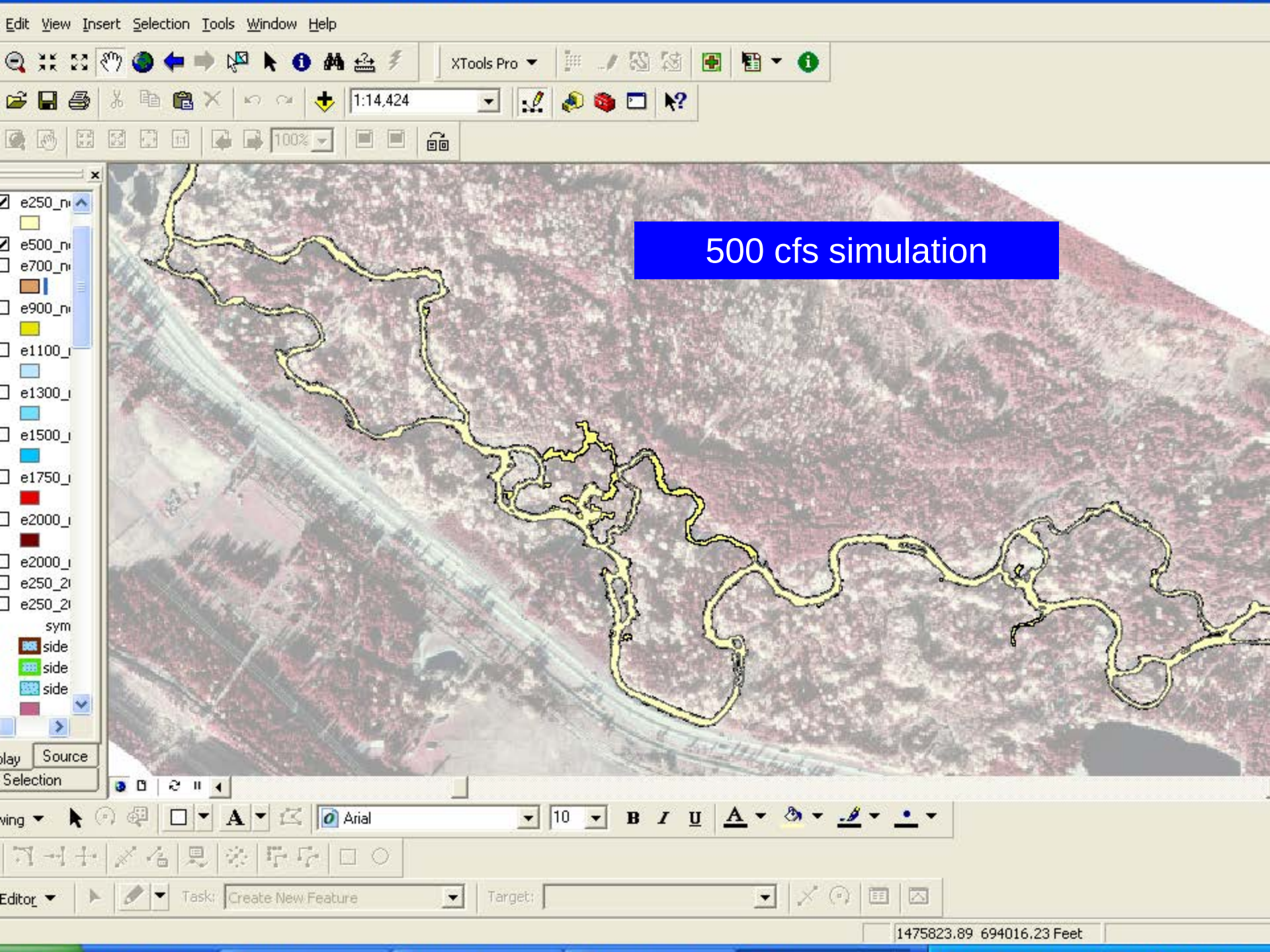
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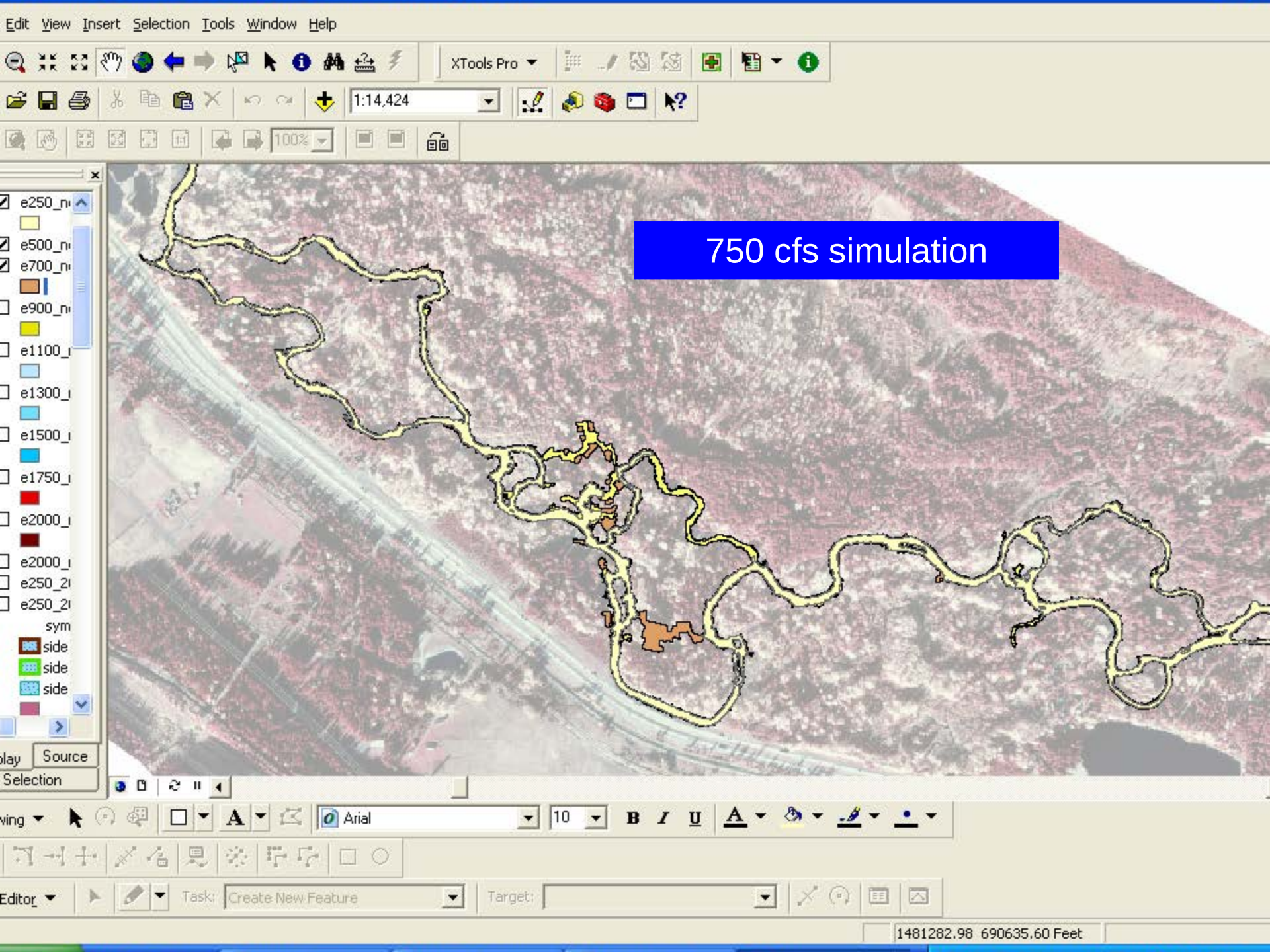
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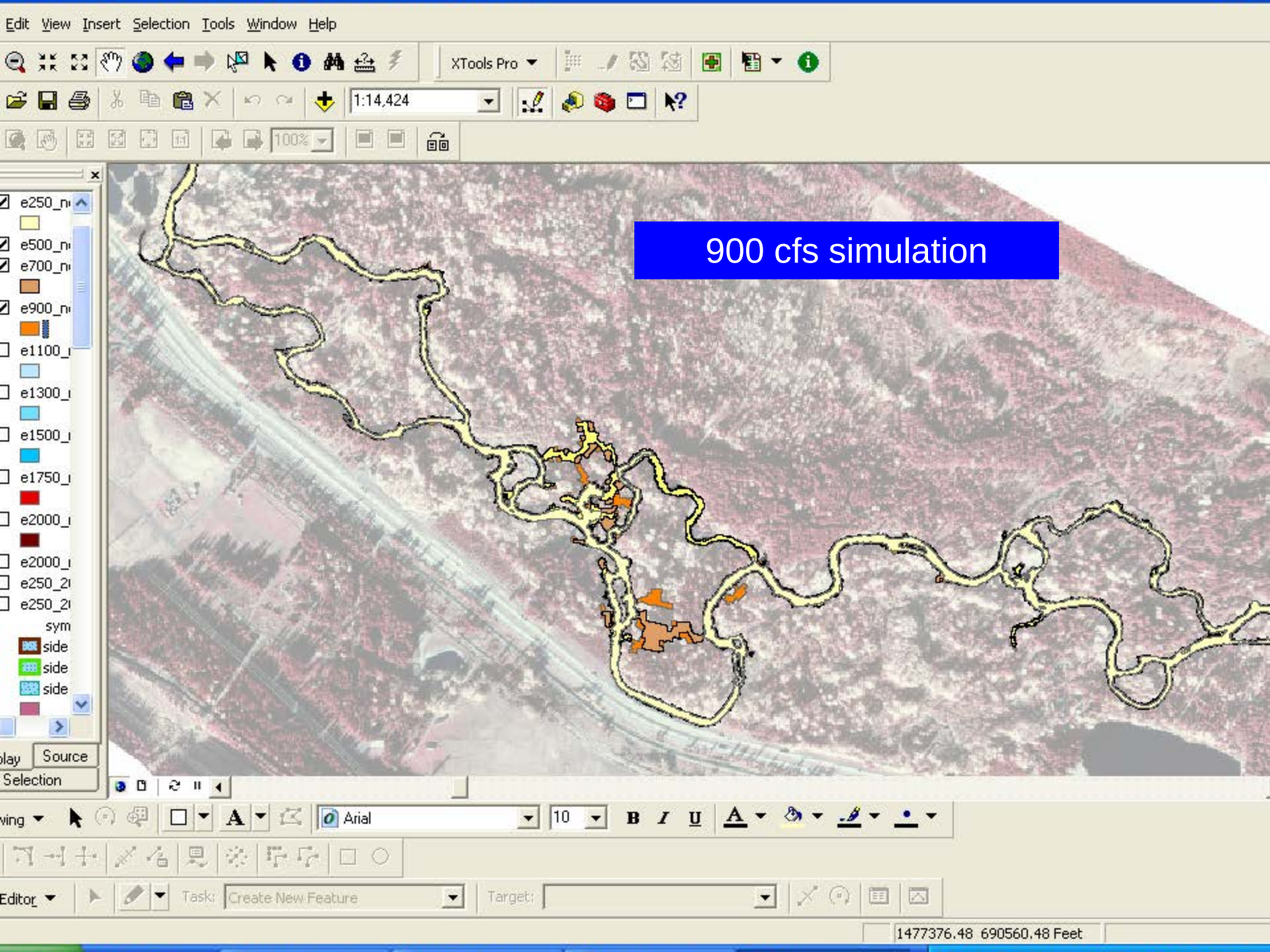
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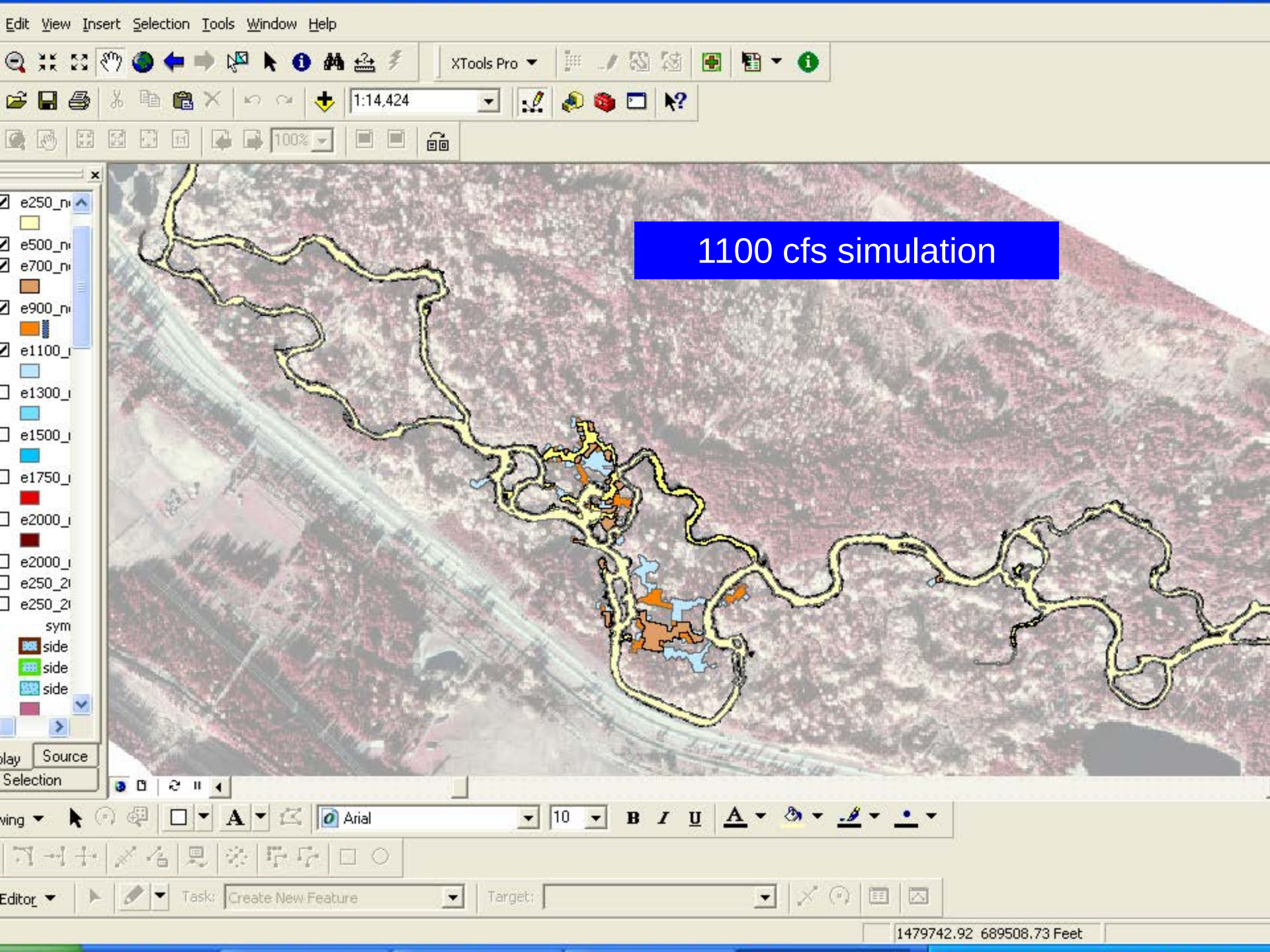
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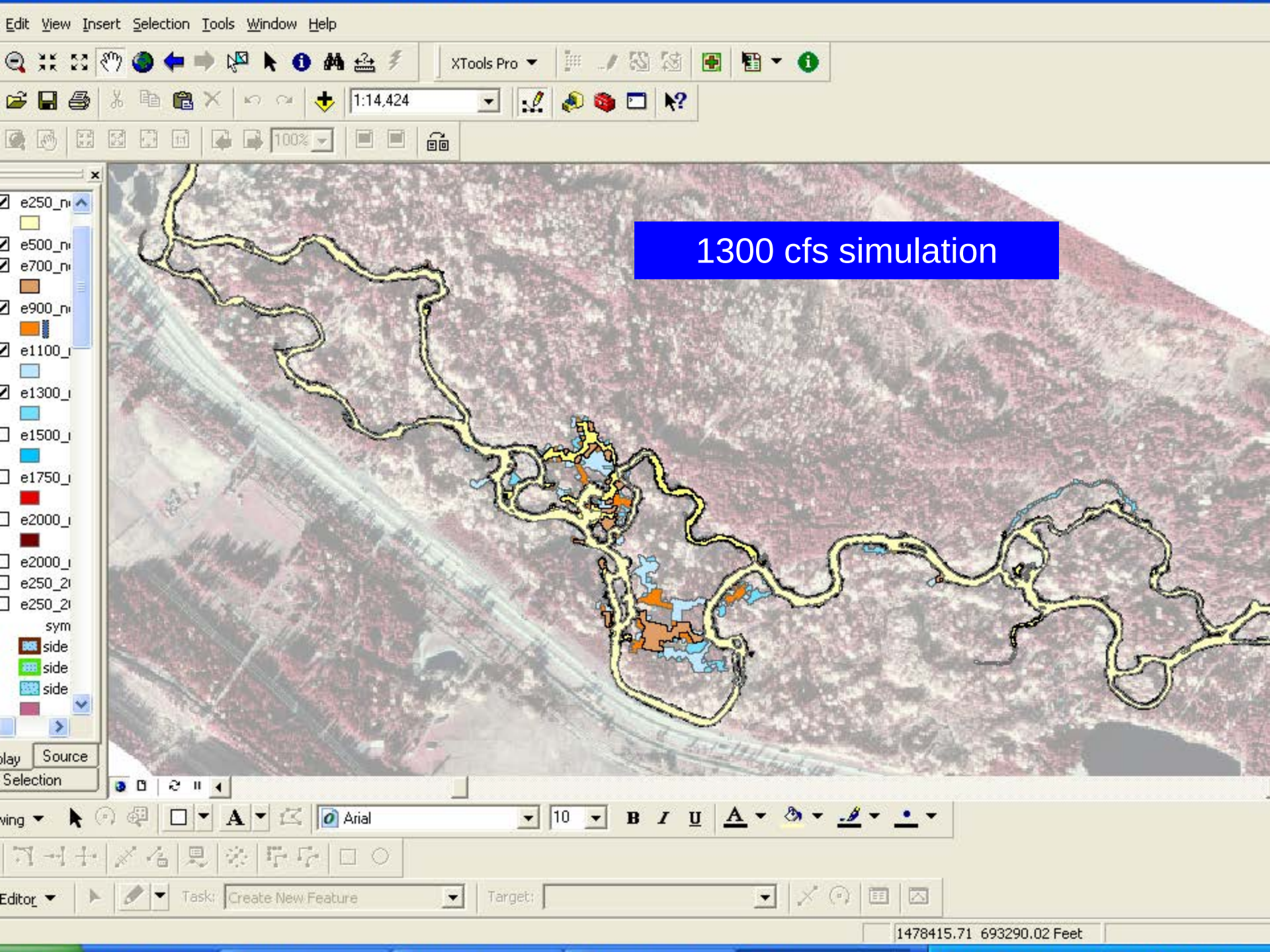
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Editor
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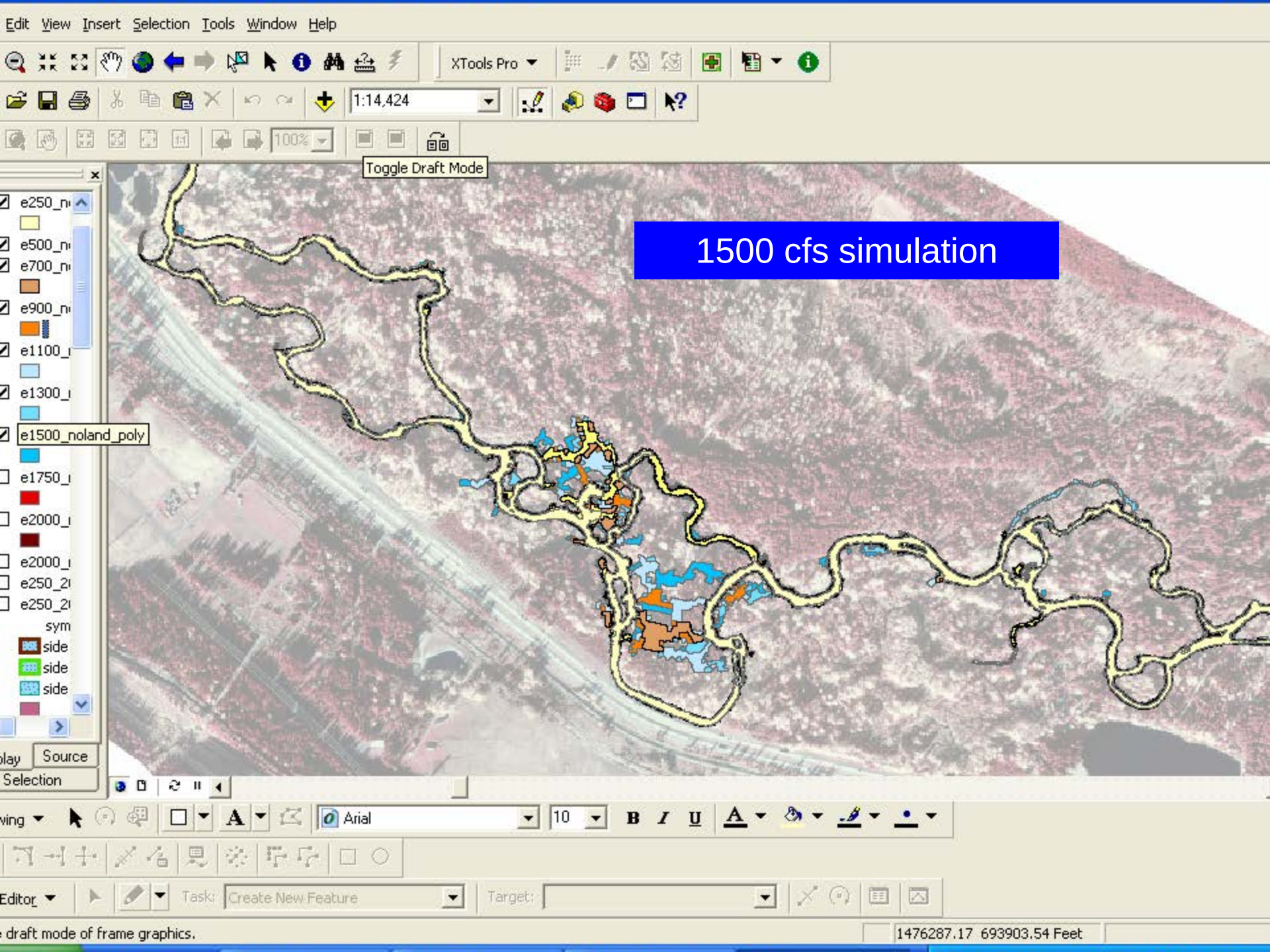
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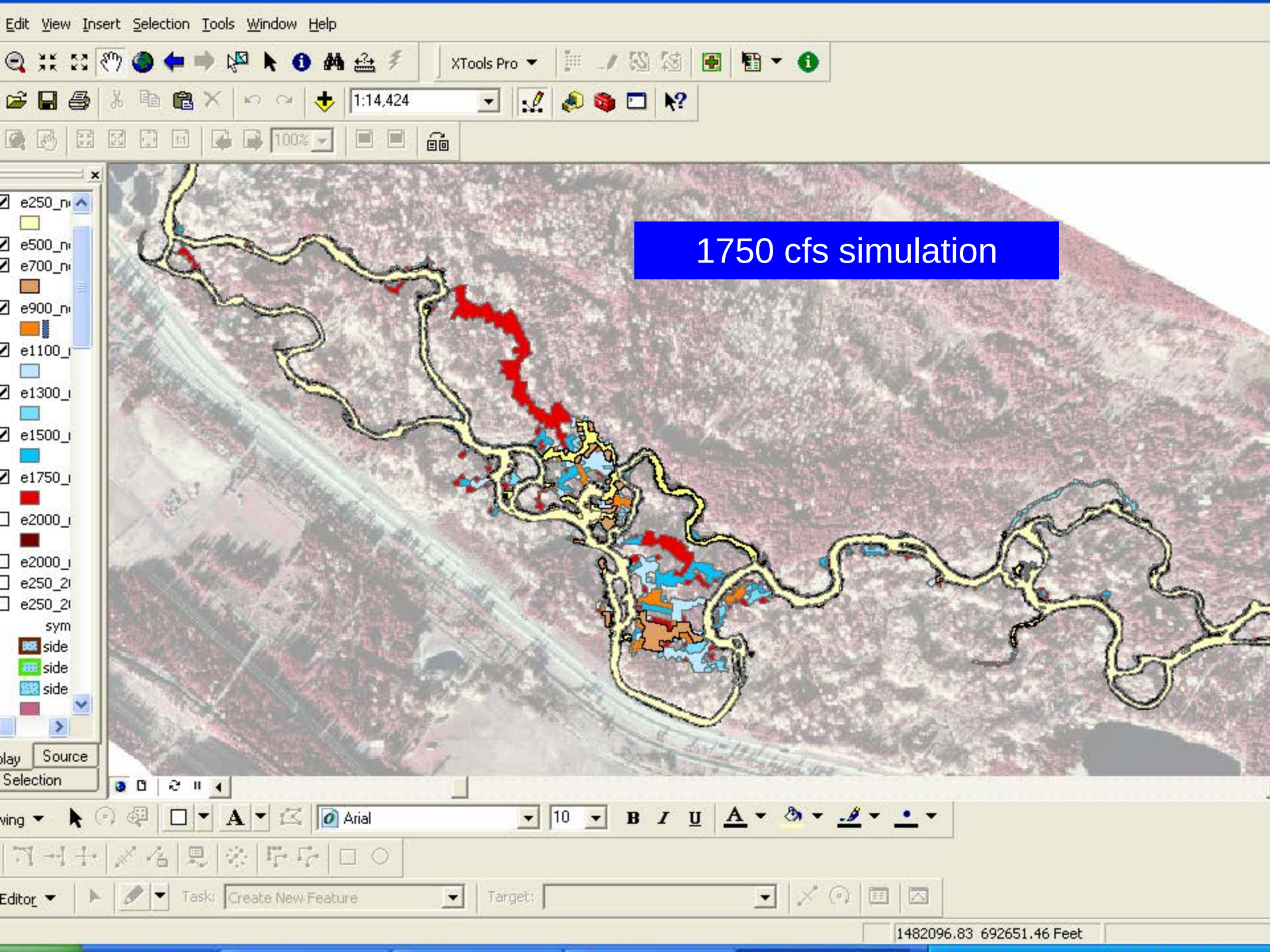
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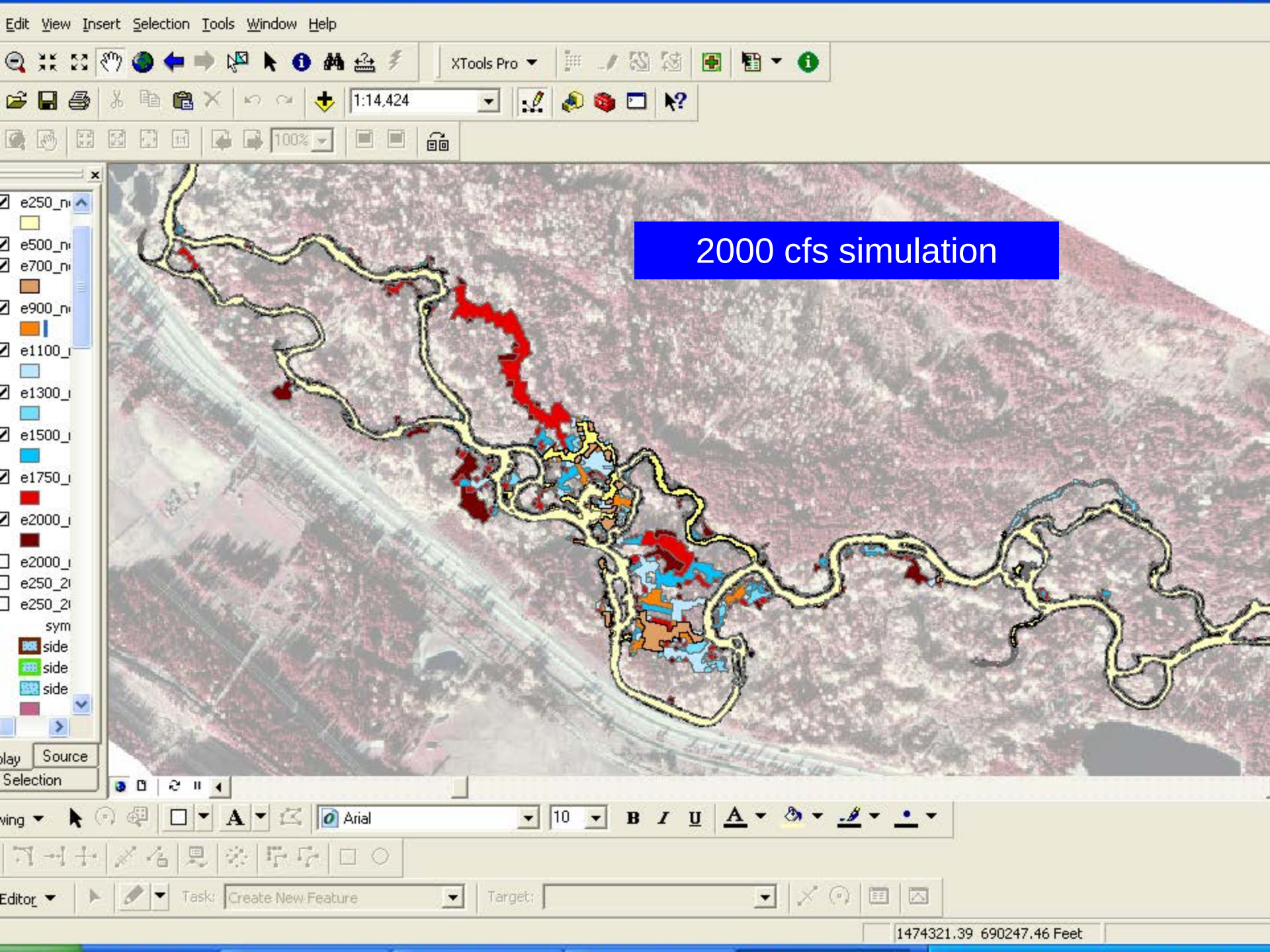
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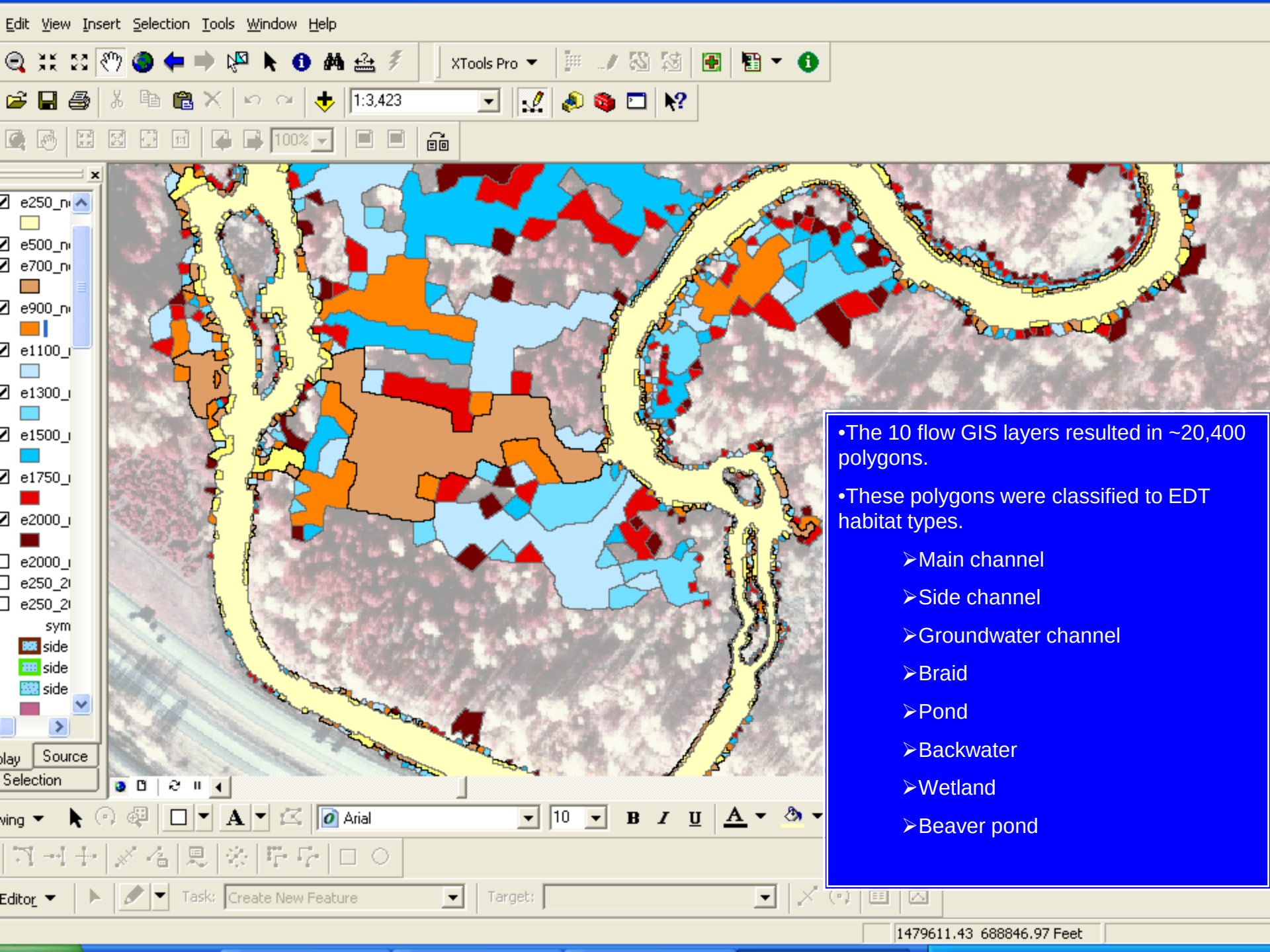
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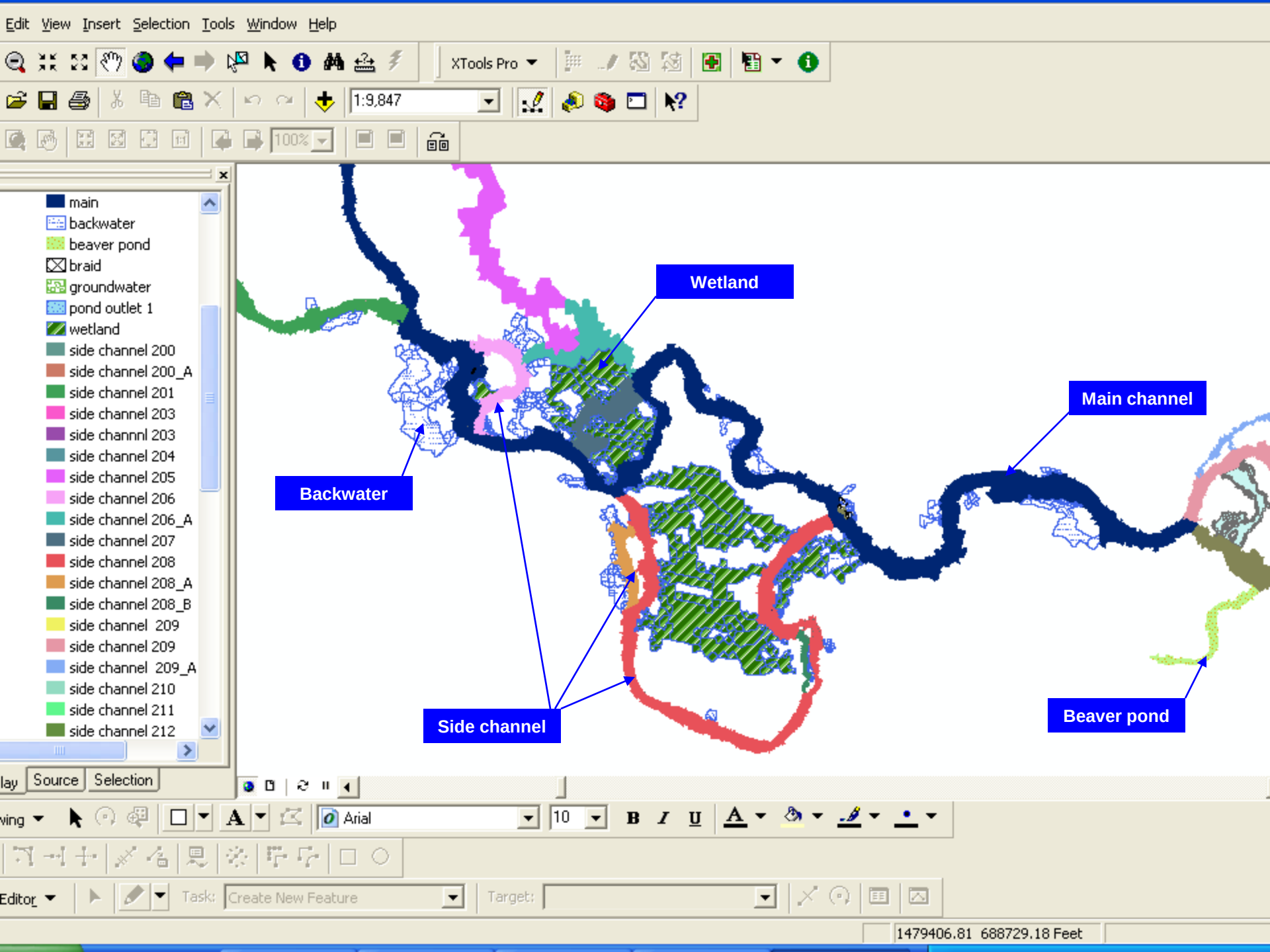
Editor
Task:
Create New Feature
Target:
1479611.43 688846.97 Feet
•The 10 flow GIS layers resulted in ~20,400 polygons.
•These polygons were classified to EDT habitat types.
➢Main channel
➢Side channel
➢Groundwater channel
➢Braid
➢Pond
➢Backwater
➢Wetland
➢Beaver pond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main
backwater
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braid
groundwater
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side channel 206
side channel 206_A
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side channel 208
side channel 208_A
side channel 208_B
side channel 209
side channel 209
side channel 209_A
side channel 210
side channel 211
side channel 212
Source
Selection
Wetland
Main channel
Backwater
Side channel
Beaver pond
Arial
10
Editor
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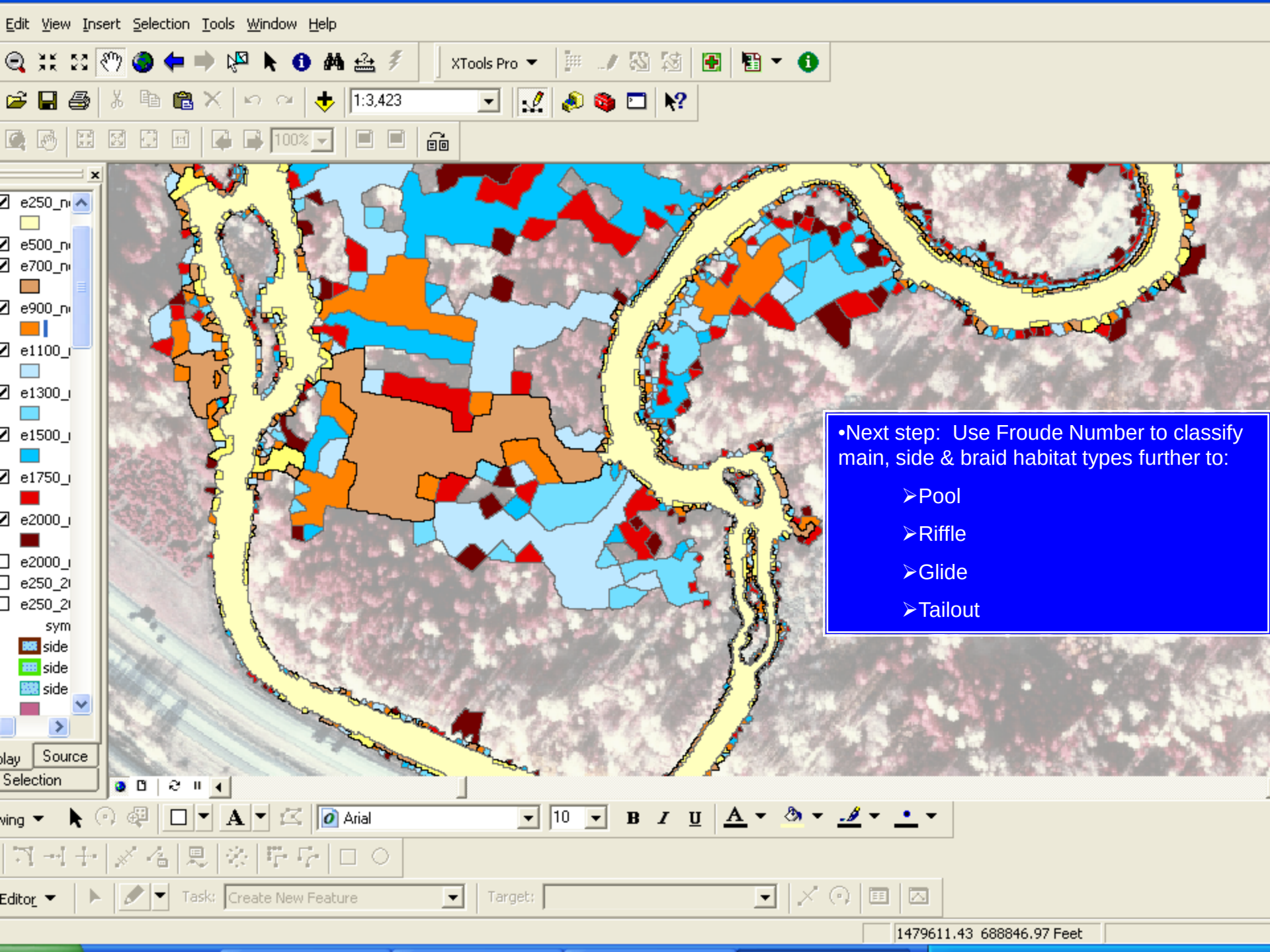
Target:
1479406.81 688729.18 Feet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side
side
side
Source
Selection
•Next step: Use Froude Number to classify main, side & braid habitat types further to:
➢Pool
➢Riffle
➢Glide
➢Tailout
Arial
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Editor
Task:
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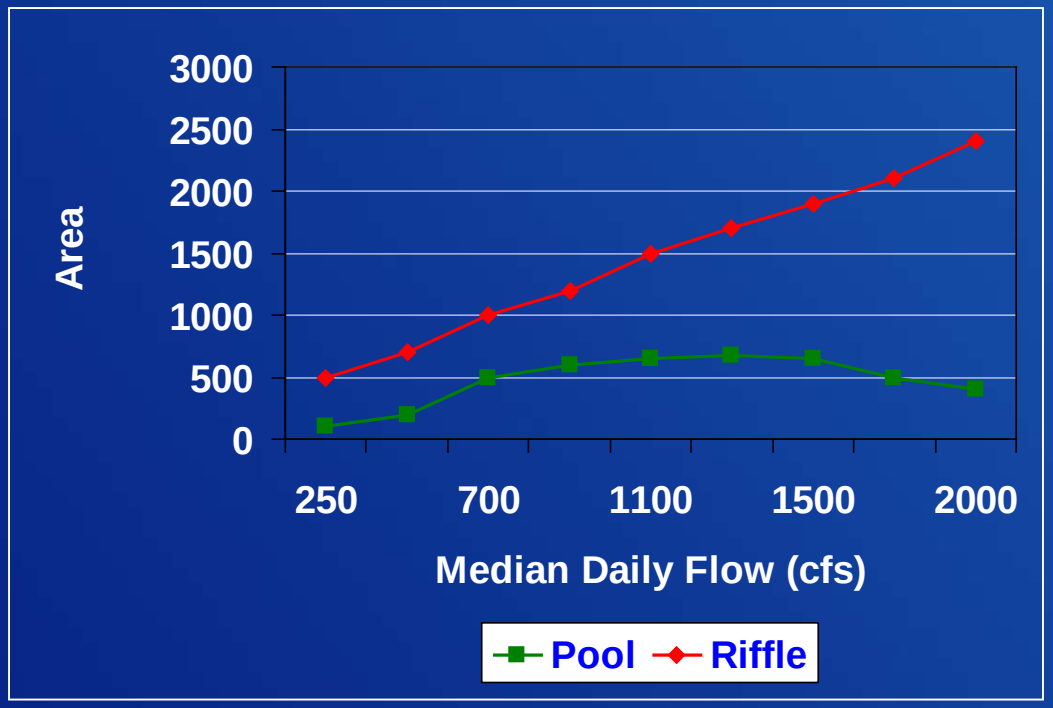
Target:
1479611.43 688846.97 Feet

Next: Develop a habitat to river discharge regression equation for each EDT (Ecosystem Diagnosis & Treatment) habitat type.



Example of Habitat to flow regression

- **Primary EDT Habitat types:**
  - Main channel
  - Side channel
  - Groundwater channel
  - Braid
  - Pond
  - Backwater
  - Wetland
  - Beaver pond
  - Pool
  - Riffle
  - Glide
  - Tailout

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River Ware Model = Daily flow time-step

↓

RiverWare Data Management Model =

- EDT flow attributes
- EDT habitat attributes
- EDT temperature attributes
- EDT sediment attributes

↓

EDT Data Management System =

- Imports data from DMM
- Imports EDT Scenario
- Computes EDT ratings & patterns
- Exports EDT Scenario

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Habitat Model Status:

- 2-D models complete for Easton, Ellensburg and lower Naches.
- 2-D Union Gap model nearly completed (run simulations being conducted).
- 2-D Wapato model is scheduled for completion by year's end.
- Next step complete GSI habitat amount to flow analysis and build the habitat-flow regression equations.
- Incorporate the habitat-flow regression equations into the Data Management Model (DMM).

HEC-RAS (1-D) Model Status:

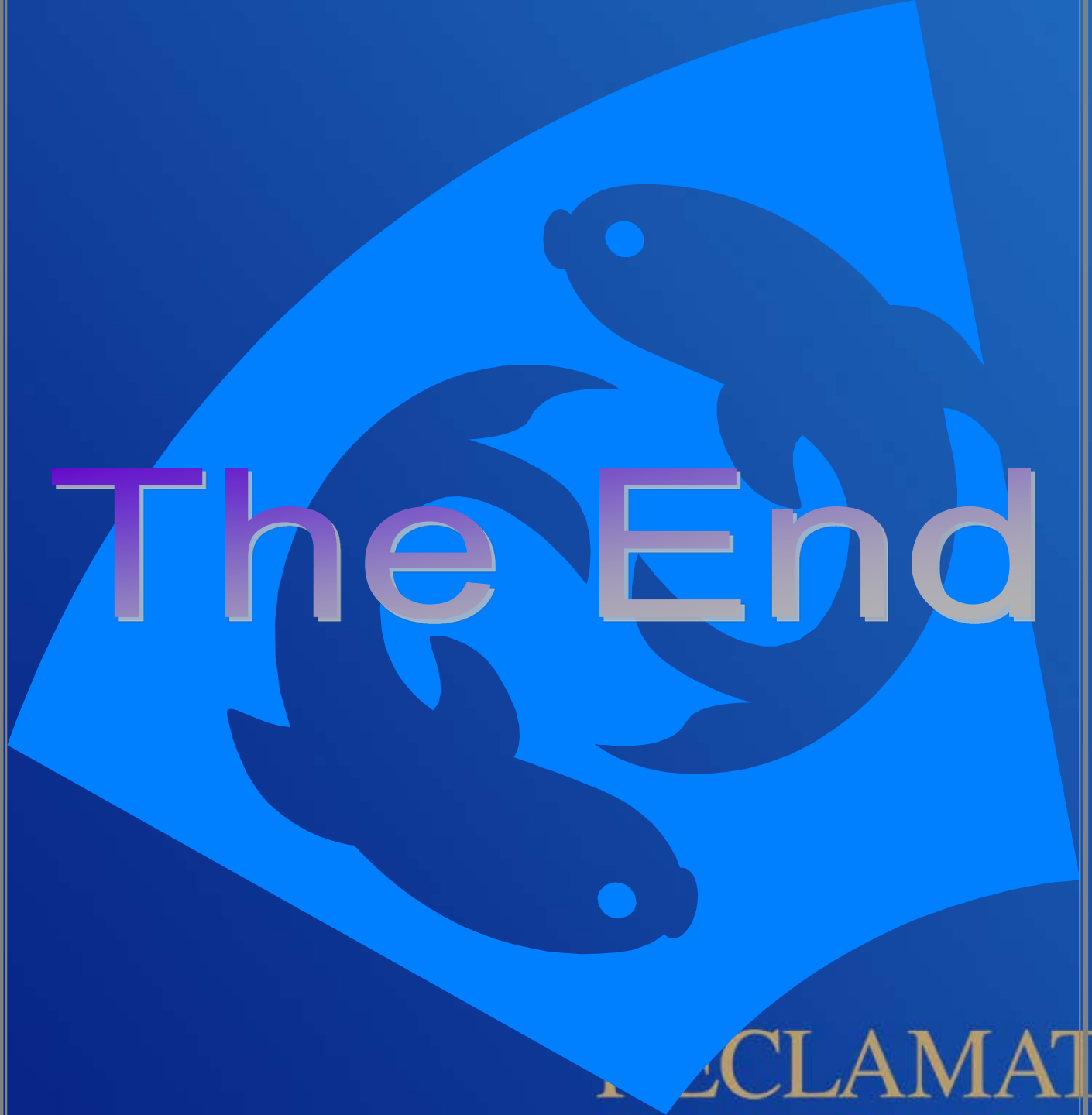
- Study Reaches: Easton Reach; Town Dam to Wilson Creek; Roza dam to Prosser dam; Chandler Power Plant reach and Tieton River to Naches River confluence.
- Field survey work completed.
- Model construction scheduled for completion by fall.

Temperature Model Status:

- Focus on the Roza Dam to Prosser Dam reach.
- Data collection continuing through fall 2006.
- Draft model nearly completed and will be updated after the 2006 field season.

Sediment (SIAM) Model Status:

- Field sampling and gravel analysis completed in 2005.
- Awaiting completion of the HEC-RAS model to proceed.



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