
BRAT – BEAVER RESTORATION ASSESSMENT TOOL

Exercise 3

Deriving Stream Power



TODAY'S PLAN



- 9:00 - 10:30 ish - Background & Theory on BRAT
- 10:30 - 10:45 - Break
- 10:45 - 12:00 - Prepping your Data
- 12:00- 12:30 - LUNCH
- 12:30 - 1:30 - Using LANDFIRE to run Vegetation Capacity Model
- 1:30 - 2:30 - **Deriving Stream Power**
- 2:30 -3:30 - Running BRAT Dam Building Capacity Model
- 3:30 -4:00 - Interpreting Results, Extending Analyses & Verification



WHAT DO BEAVER CARE?



- Total stream power was calculated at
 - **Base flow** to gauge the maximum stream power at which beaver can build dams
 - and at the 2-year recurrence interval flow (Q_2) to gauge the likelihood of dams persisting from year-to-year due to typical floods



HOW TO CALCULATE?



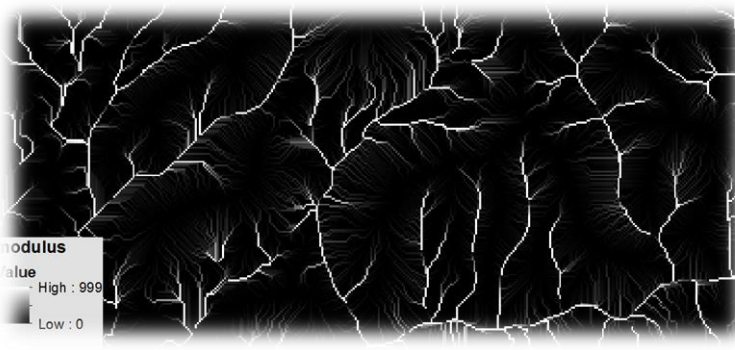
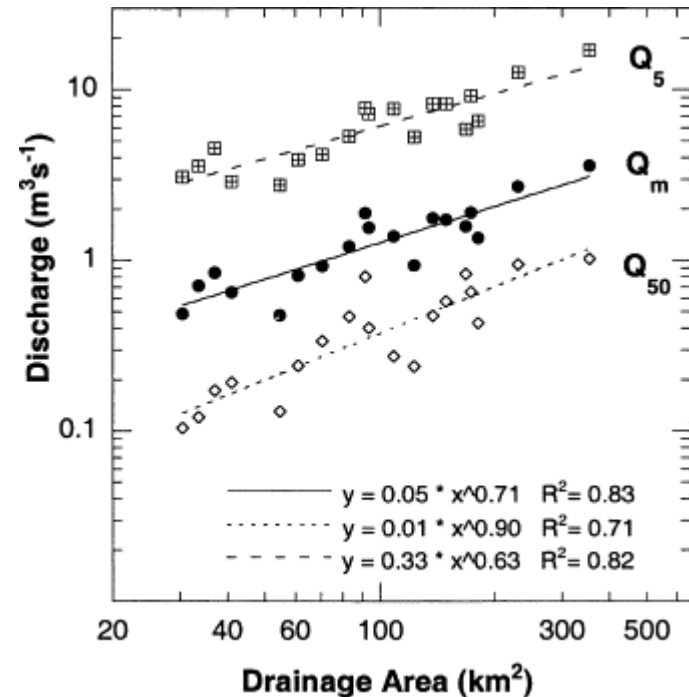
- Stream power is an expression of flow strength and the erosive capacity of streams. Stream power is calculated as:
- $\Omega = \rho g Q S$
- Where Ω is the stream power (in Watts), ρ is the density of water (1000 kg/m³), g is acceleration due to gravity (9.8 m/s²), Q is discharge (m³/s), and S is the channel slope.



WHAT DO I NEED THEN?



- $\Omega = \rho g Q S$
 - Well ρ and g are constants
 - S is slope... so we know segment length, and can get rise... (rise/run)
 - Q ?... Which Q ?
 - We will use regional curves to get Q and relate it to drainage area...



DERIVING STREAM POWER

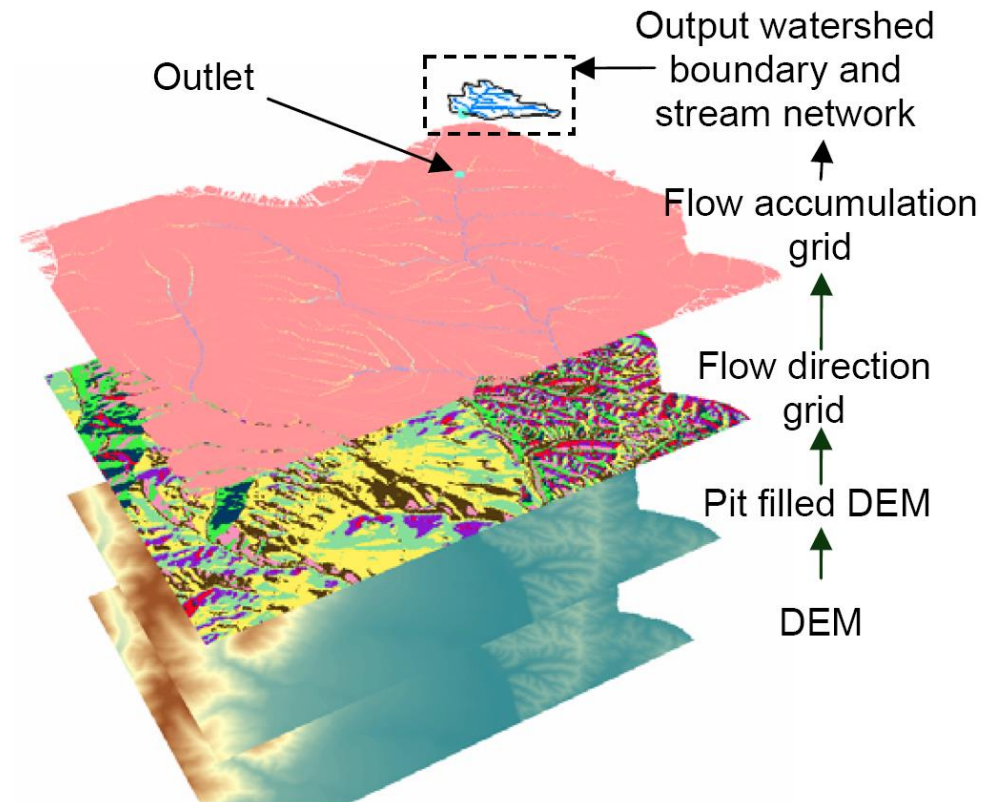


- I. Calculate Flow Accumulation Drainage Area
- II. Extract drainage areas from DEM to reach segments
- III. Extract elevations from DEM to reach segments for reach slope calculation
- IV. Export and prepare table for Matlab code...



SIMPLE STEPS

1. Pit-fill DEM
2. Calculate Flow Direction
3. Calculate Flow Accumulation



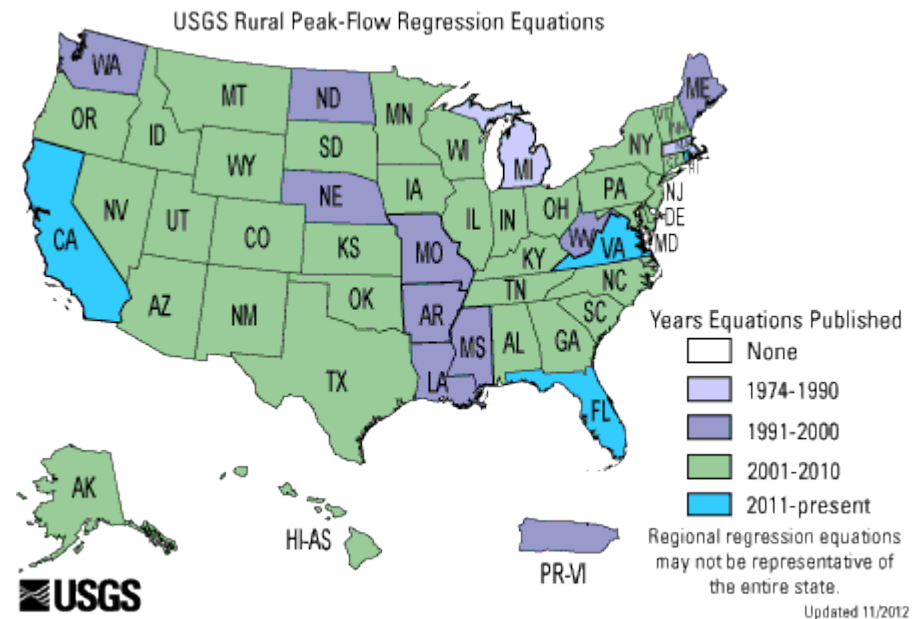
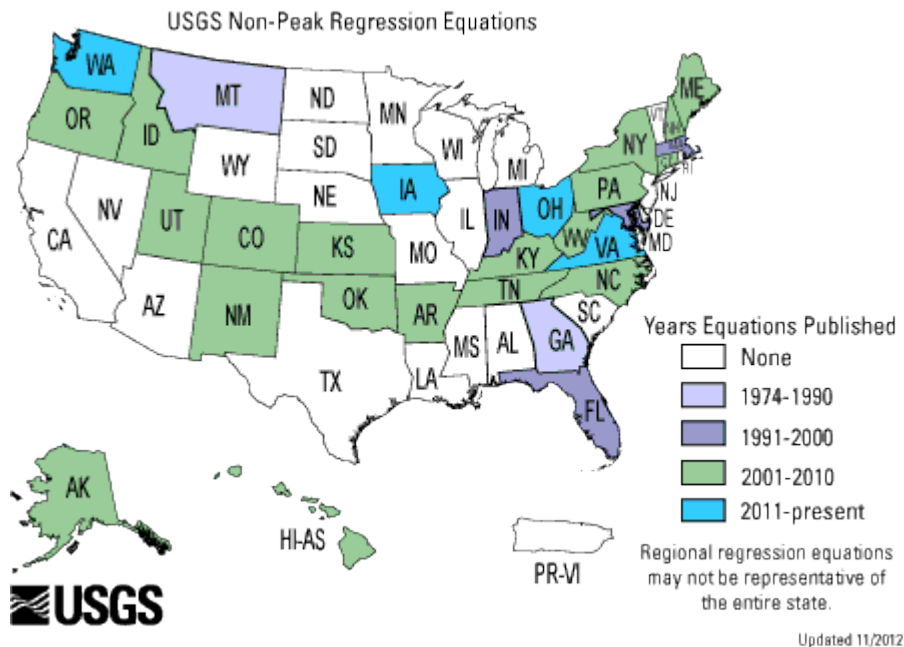
Images from [Multi-Watershed Delineation Tool Manual](#)

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WHILE THAT IS RUNNING...

- Find yourself some regression equations



VISIT: <http://water.usgs.gov/osw/programs/nss/low-flow.html>



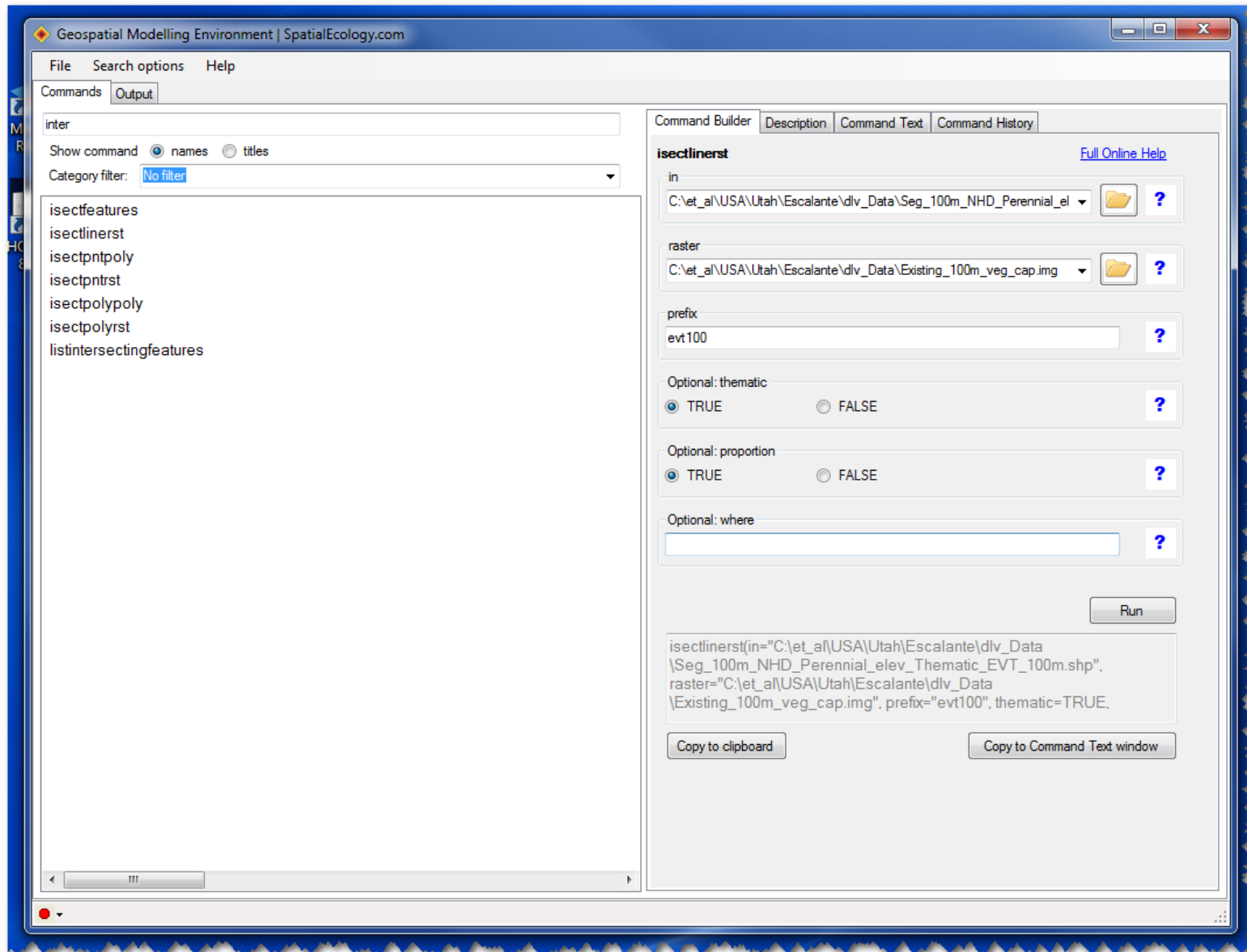
DERIVING STREAM POWER



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BACK TO GME... GET DRAINAGE AREA...



DERIVING STREAM POWER



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STILL IN GME... JUST GET ELEVATIONS

The screenshot displays the Geospatial Modelling Environment (GME) interface. The window title is "Geospatial Modelling Environment | SpatialEcology.com". The interface is divided into several sections:

- File Search options Help**: A menu bar at the top.
- Commands Output**: A tabbed interface for managing commands.
- Search**: A search bar with "inter" entered, and options for "Show command" (names selected, titles unselected) and "Category filter" (No filter).
- Command List**: A list of available commands including isectfeatures, isectlinerst, isectpntpoly, isectpnrst, isectpolypoly, isectpolyrst, and listintersectingfeatures.
- Command Builder**: A detailed configuration window for the "isectlinerst" command, showing:
 - in**: A file path dropdown set to "C:\et_al\USA\Utah\Escalante\dlv_Data\Seg_100m_NHD_Perennial_el".
 - raster**: A file path dropdown set to "C:\et_al\USA\Utah\Escalante\dlv_Data\Existing_100m_veg_cap.img".
 - prefix**: A text input field containing "evt100".
 - Optional: thematic**: Radio buttons for TRUE (selected) and FALSE.
 - Optional: proportion**: Radio buttons for TRUE (selected) and FALSE.
 - Optional: where**: An empty text input field.
 - Run**: A button to execute the command.
 - Command Text**: A text area showing the generated command: `isectlinerst(in="C:\et_al\USA\Utah\Escalante\dlv_Data\Seg_100m_NHD_Perennial_elev_Thematic_EVT_100m.shp", raster="C:\et_al\USA\Utah\Escalante\dlv_Data\Existing_100m_veg_cap.img", prefix="evt100", thematic=TRUE,`
 - Copy to clipboard** and **Copy to Command Text window**: Buttons for copying the command.

DERIVING STREAM POWER



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CLEAN UP THAT TABLE... IN EXCEL

- All you need to do is make sure that
 - Columns 4 & 5 are your **upstream and downstream elevations** ElevBEG & ElevEND
 - Column 6 is your **segment Length**
 - Column 10 is your **cumulative drainage area (DrainKM)**

	A	B	C	D	E	F	G	H	I	J
1	FID	ElevMIN	ElevMAX	ElevBEG	ElevEND	Length	Slope	Veg30m	Veg100m	DrainKM
2	1	2629.832	2658.415	2658.415	2631.74	446.44	0.064024	3.102293	3.202512	58.919
3	2	3304.854	3305.191	3304.909	3305.172	99.9996	0.003369	3.333333	3.428571	0.012
4										

