From Modeled to Mapped: How to Delineate a Floodplain

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IAFSM 2023 Annual Conference – 3/14/2023

ILLINOIS

Illinois State Water Survey
PRAIRIE RESEARCH INSTITUTE

Overview

- How this started
- Outputs from stream models
- Overall delineation process
- Super simple stream (example)
- Dealing with tributaries
- Additions we've made to the tools
- Future plans

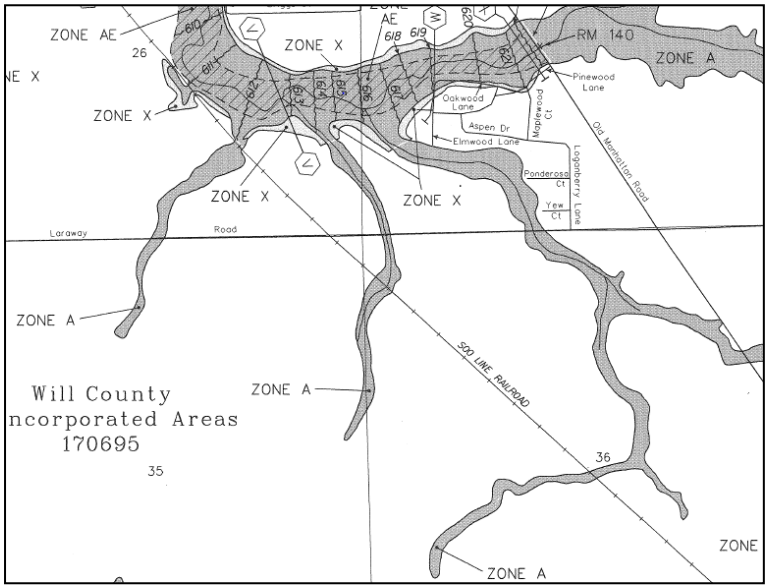
Disclaimer

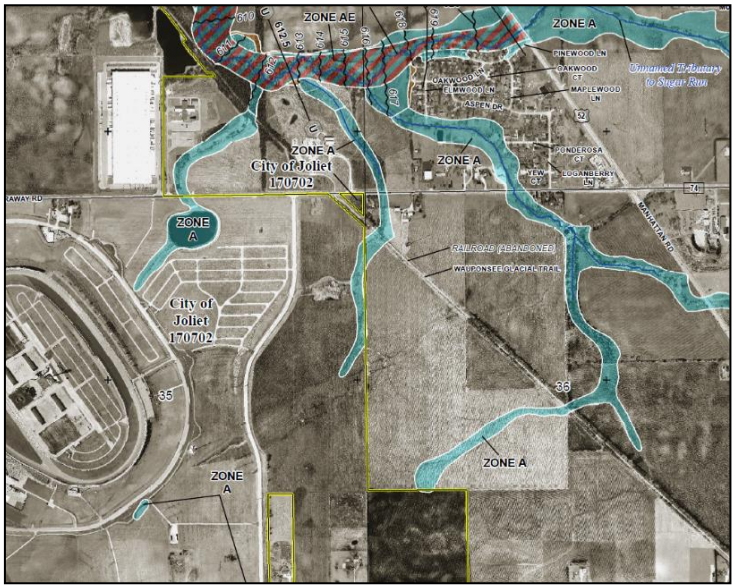
I might be getting old…

ArcMap

Python 2

Back in the Day…

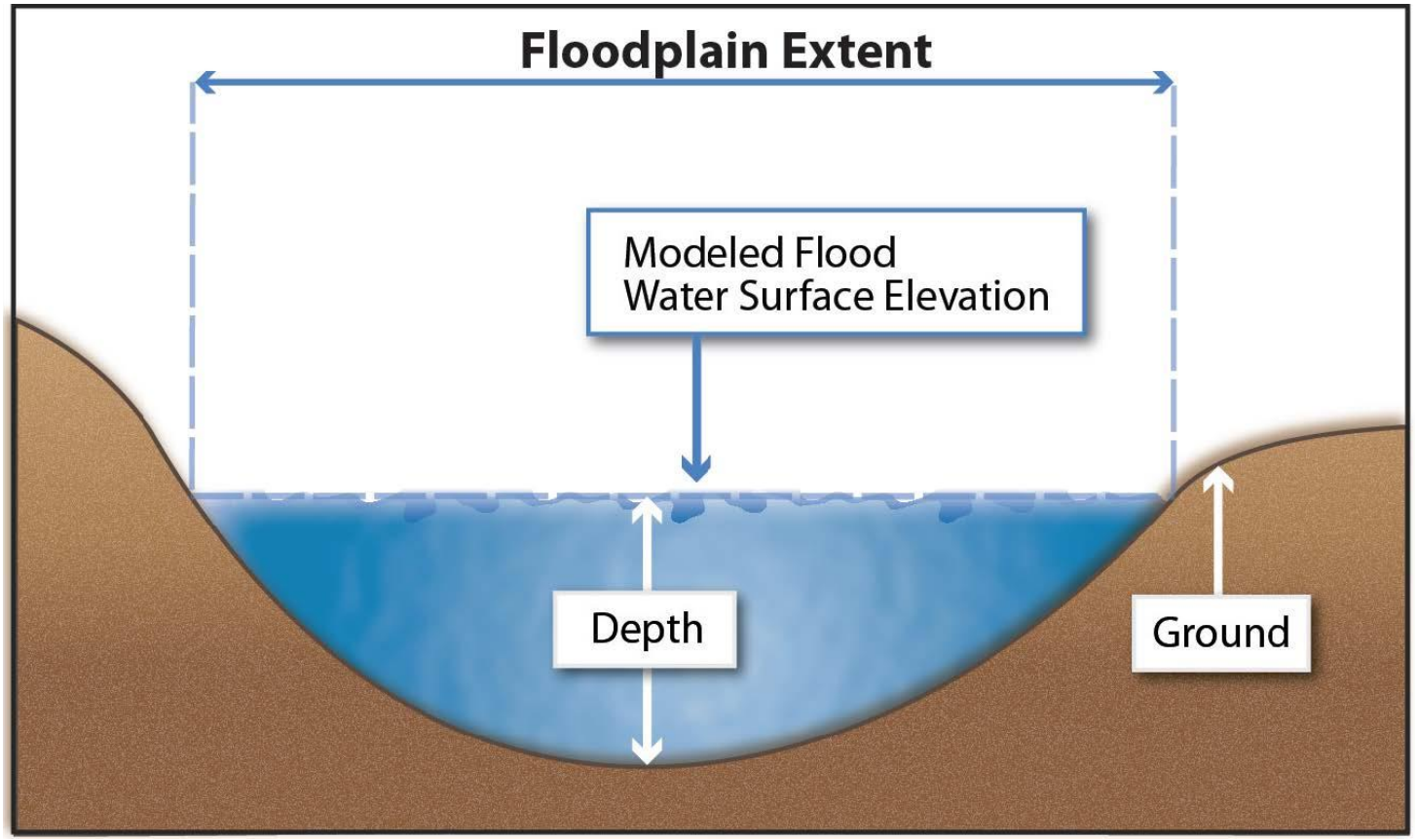




Digital = Yes

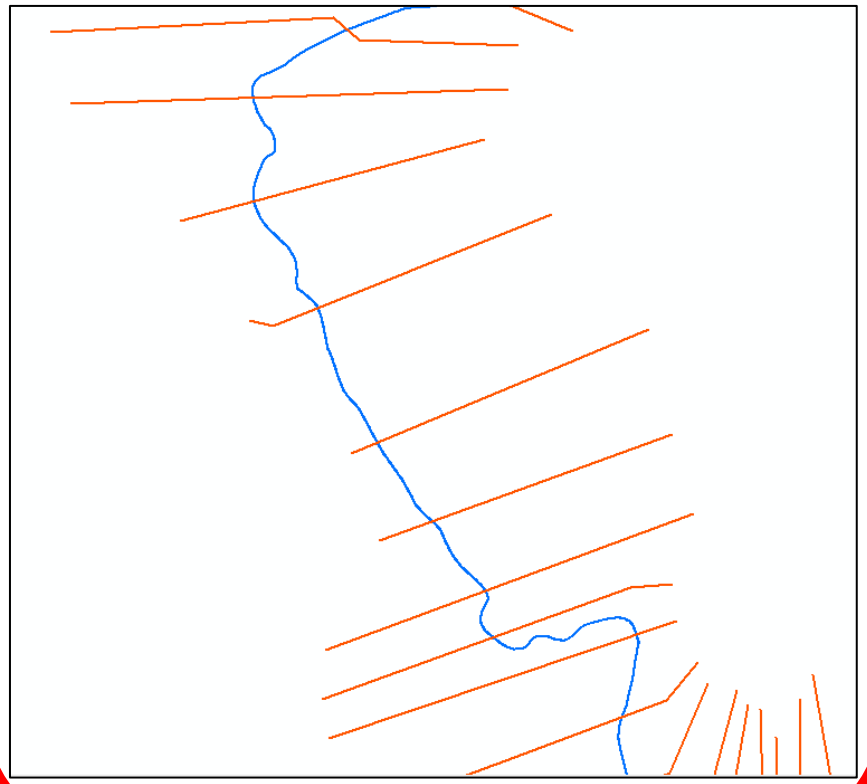
Realistic = Not Always

New Stream Studies

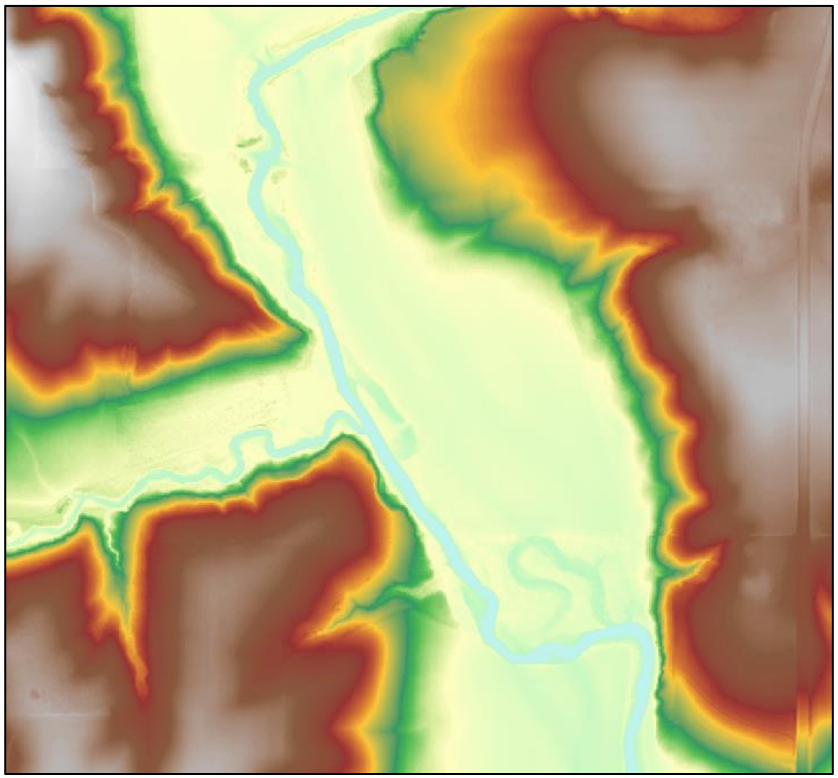


New Stream Studies

1-D

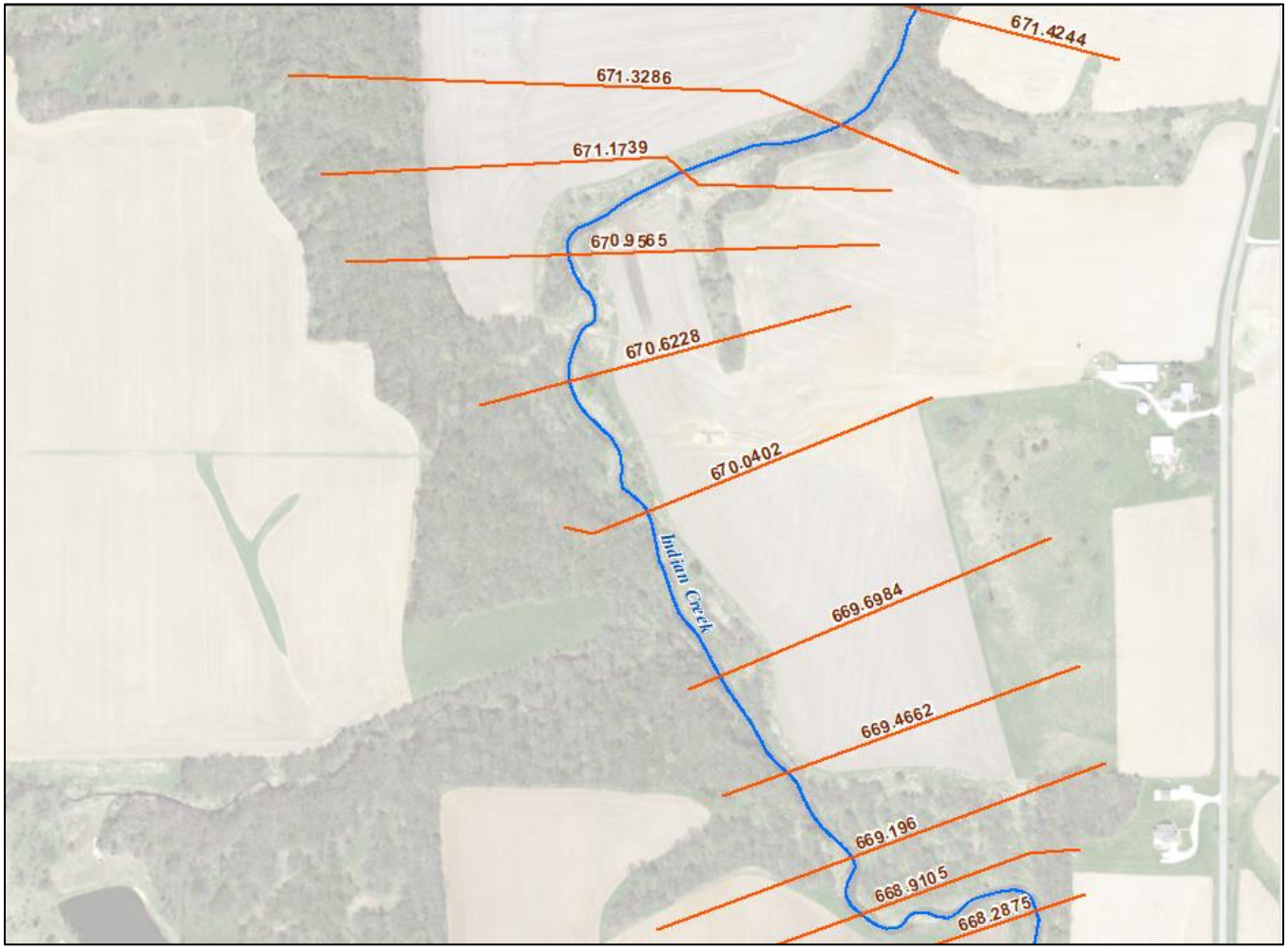


2-D

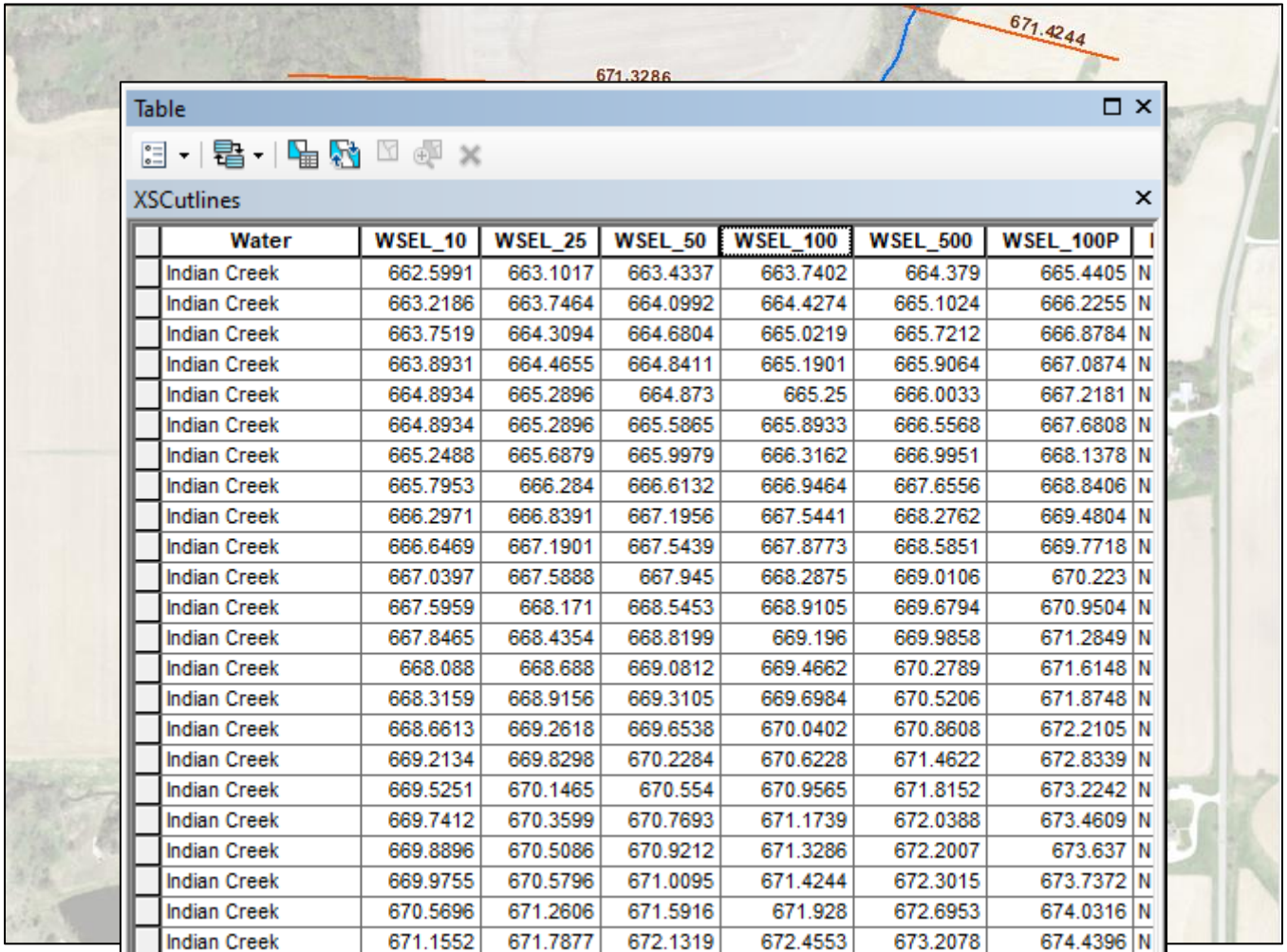


New Study Model Outputs

New Study Model Outputs



New Study Model Outputs

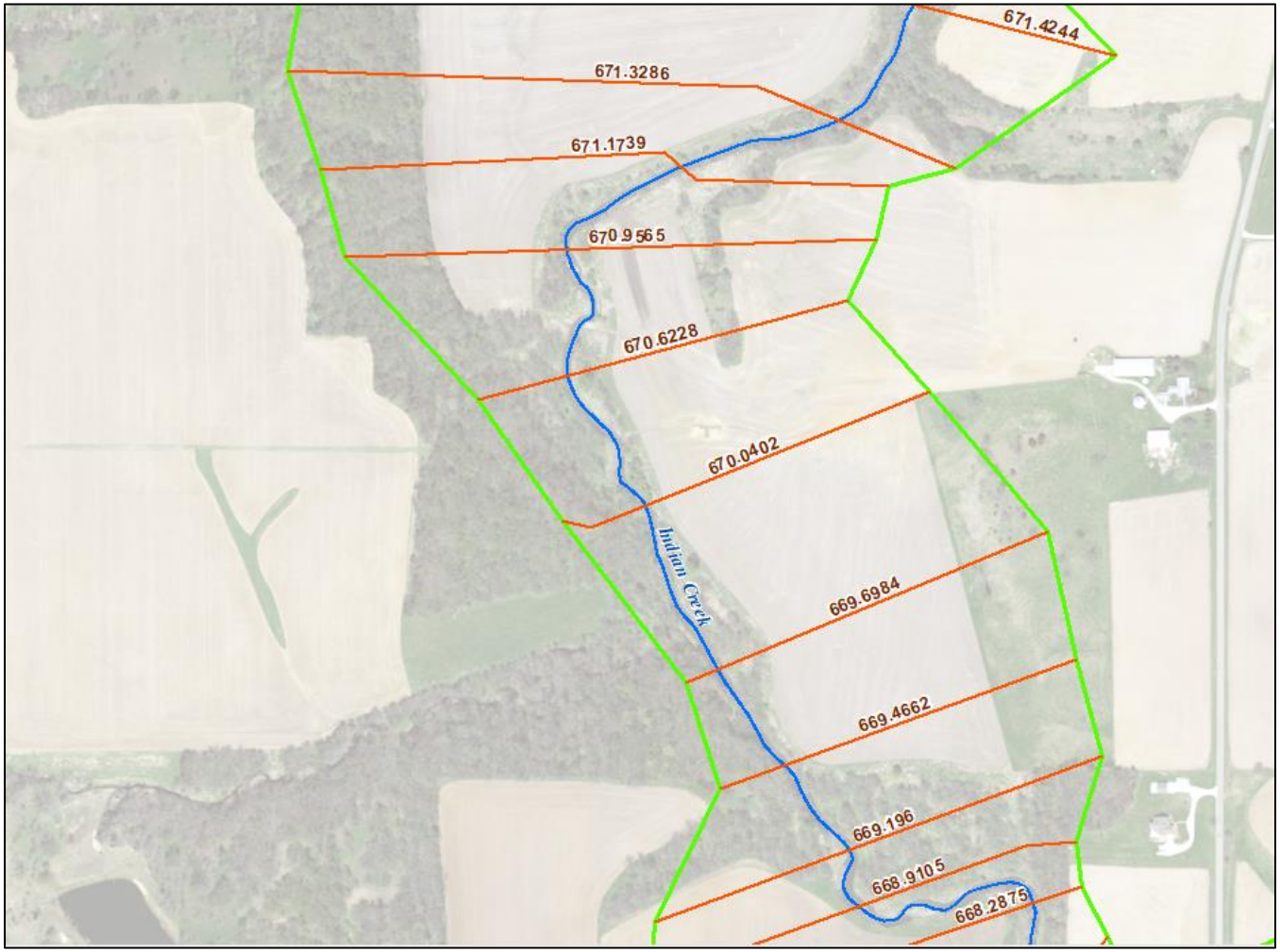


Table

XSCutlines

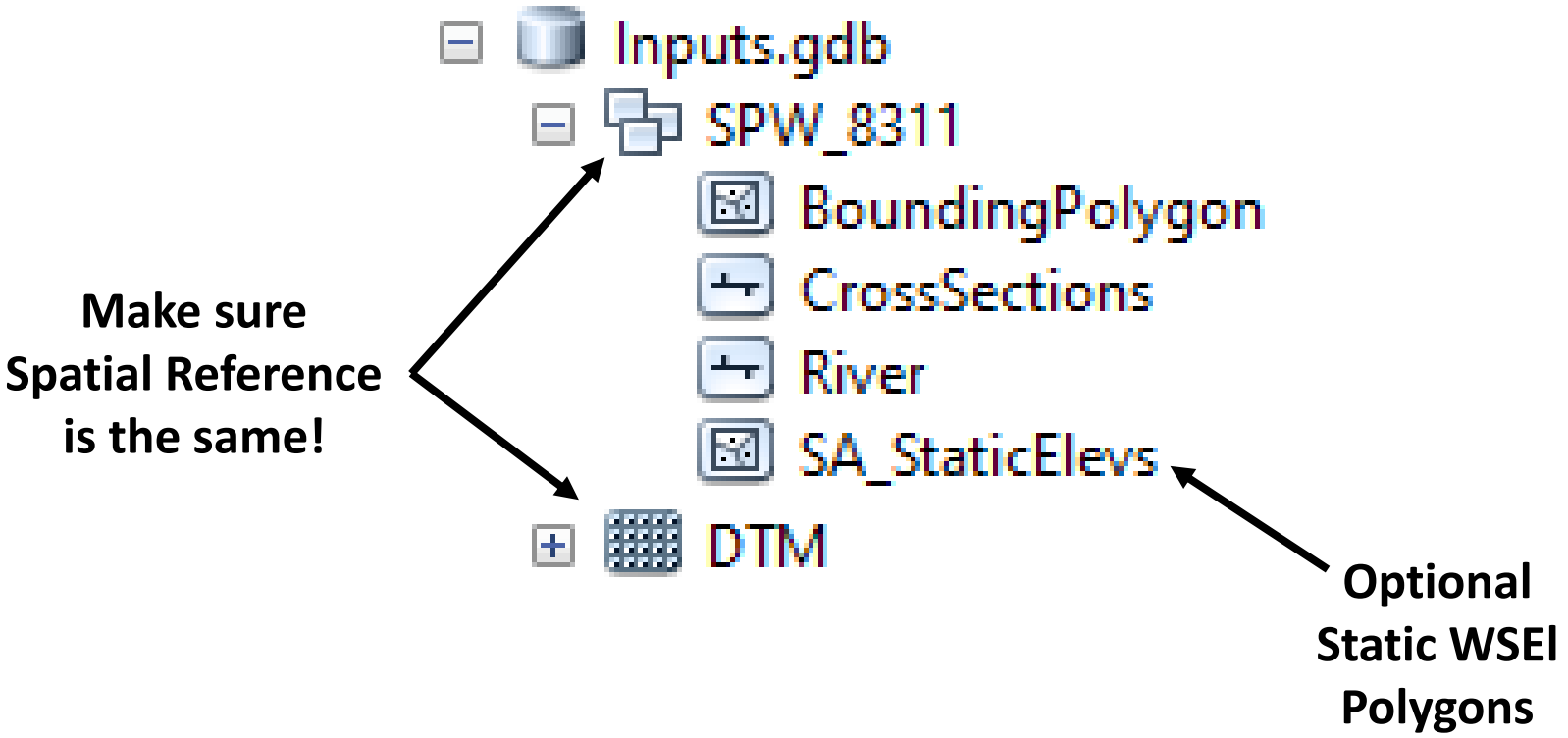
Water	WSEL_10	WSEL_25	WSEL_50	WSEL_100	WSEL_500	WSEL_100P	I
Indian Creek	662.5991	663.1017	663.4337	663.7402	664.379	665.4405	N
Indian Creek	663.2186	663.7464	664.0992	664.4274	665.1024	666.2255	N
Indian Creek	663.7519	664.3094	664.6804	665.0219	665.7212	666.8784	N
Indian Creek	663.8931	664.4655	664.8411	665.1901	665.9064	667.0874	N
Indian Creek	664.8934	665.2896	664.873	665.25	666.0033	667.2181	N
Indian Creek	664.8934	665.2896	665.5865	665.8933	666.5568	667.6808	N
Indian Creek	665.2488	665.6879	665.9979	666.3162	666.9951	668.1378	N
Indian Creek	665.7953	666.284	666.6132	666.9464	667.6556	668.8406	N
Indian Creek	666.2971	666.8391	667.1956	667.5441	668.2762	669.4804	N
Indian Creek	666.6469	667.1901	667.5439	667.8773	668.5851	669.7718	N
Indian Creek	667.0397	667.5888	667.945	668.2875	669.0106	670.223	N
Indian Creek	667.5959	668.171	668.5453	668.9105	669.6794	670.9504	N
Indian Creek	667.8465	668.4354	668.8199	669.196	669.9858	671.2849	N
Indian Creek	668.088	668.688	669.0812	669.4662	670.2789	671.6148	N
Indian Creek	668.3159	668.9156	669.3105	669.6984	670.5206	671.8748	N
Indian Creek	668.6613	669.2618	669.6538	670.0402	670.8608	672.2105	N
Indian Creek	669.2134	669.8298	670.2284	670.6228	671.4622	672.8339	N
Indian Creek	669.5251	670.1465	670.554	670.9565	671.8152	673.2242	N
Indian Creek	669.7412	670.3599	670.7693	671.1739	672.0388	673.4609	N
Indian Creek	669.8896	670.5086	670.9212	671.3286	672.2007	673.637	N
Indian Creek	669.9755	670.5796	671.0095	671.4244	672.3015	673.7372	N
Indian Creek	670.5696	671.2606	671.5916	671.928	672.6953	674.0316	N
Indian Creek	671.1552	671.7877	672.1319	672.4553	673.2078	674.4396	N

New Study Model Outputs



Coming up with Consistent Workflow

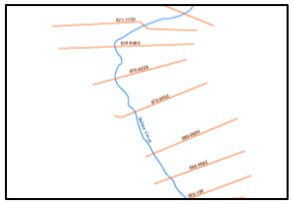
Script Tool Inputs

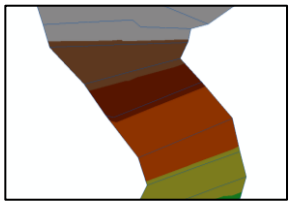


Overall Delineation Process (3 steps)

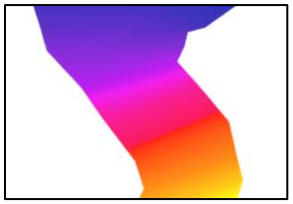
1

Cross Section Data to TIN



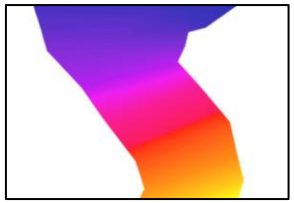


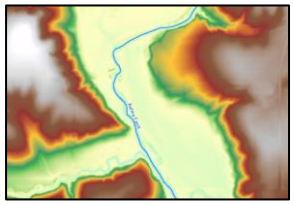
WSEl Grid



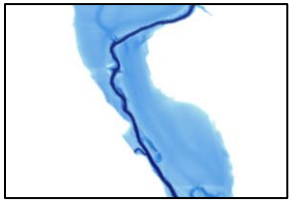
2

WSEl Grid – Topo Grid



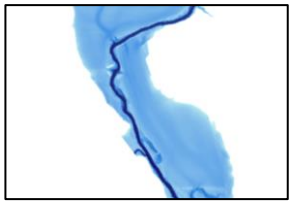


Depth Grid



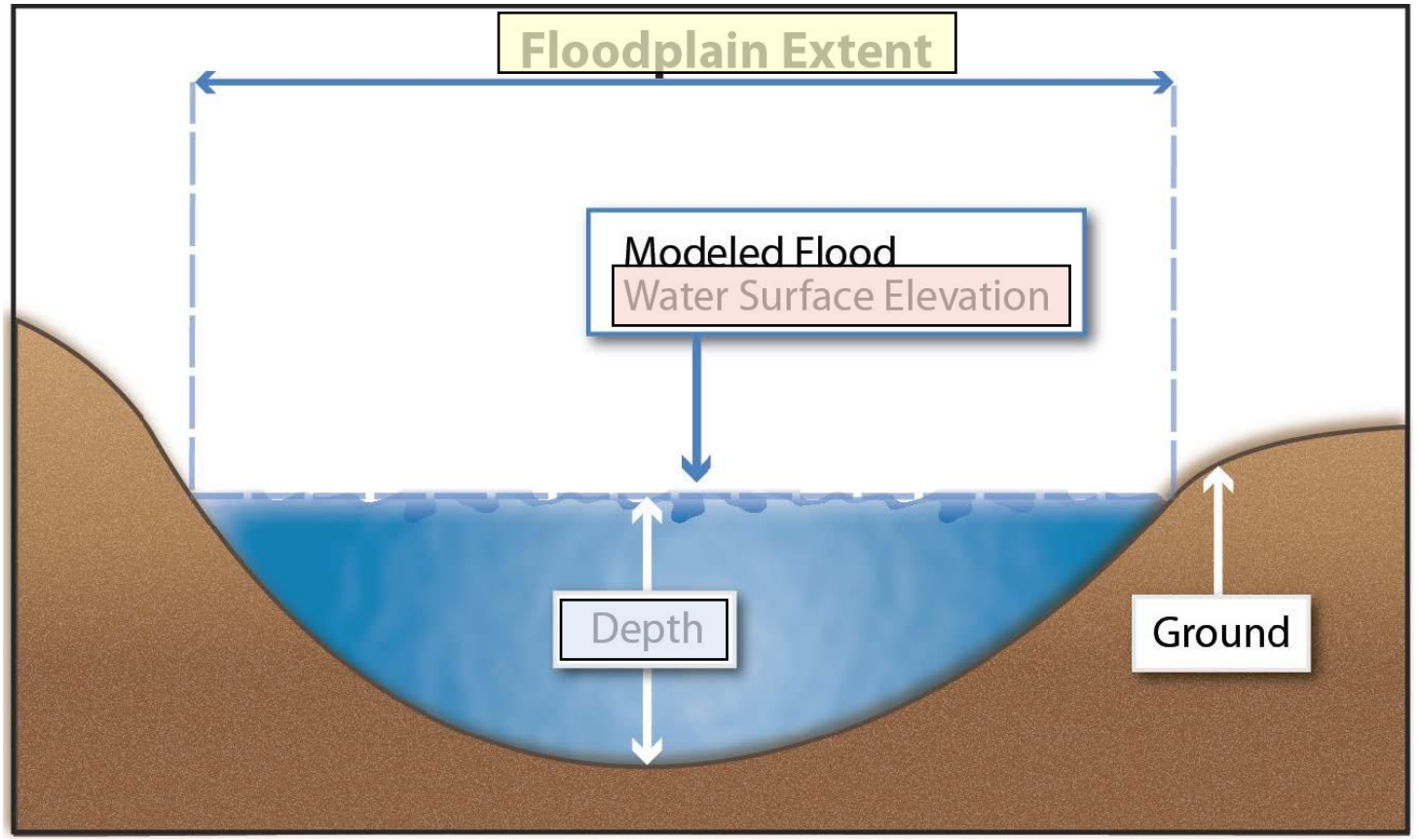
3

Depth Grid Processing

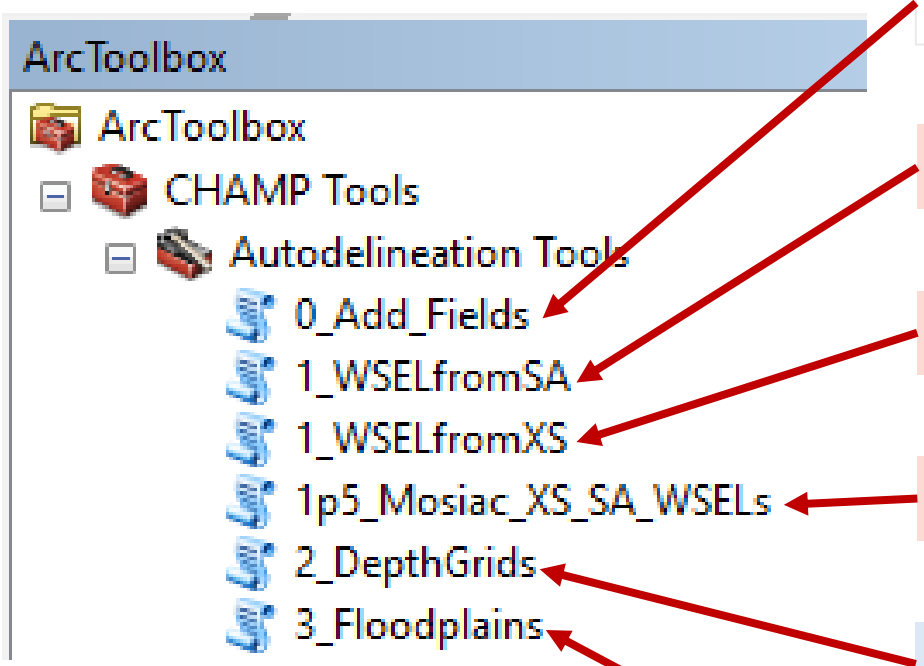


Floodplain Polygons

Overall Delineation Process (3 steps)



The Script Tools



Standardize Field Names

WSEl Grid from polygons (if needed)

WSEl Grid from Cross Sections

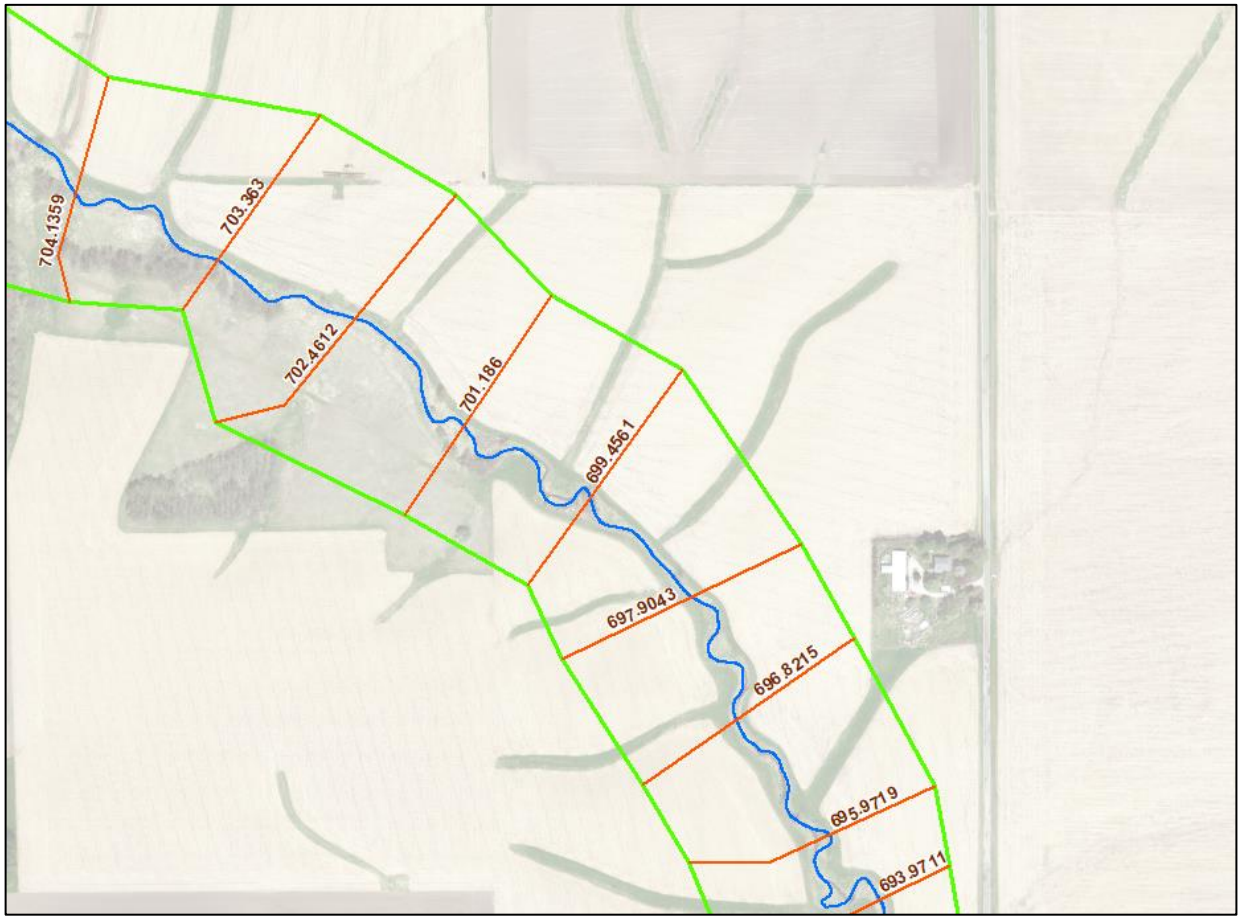
Combine WSEl Grids (if needed)

Depth Grid from WSEl & Topo Grids

Floodplain Polygons from Depth Grid

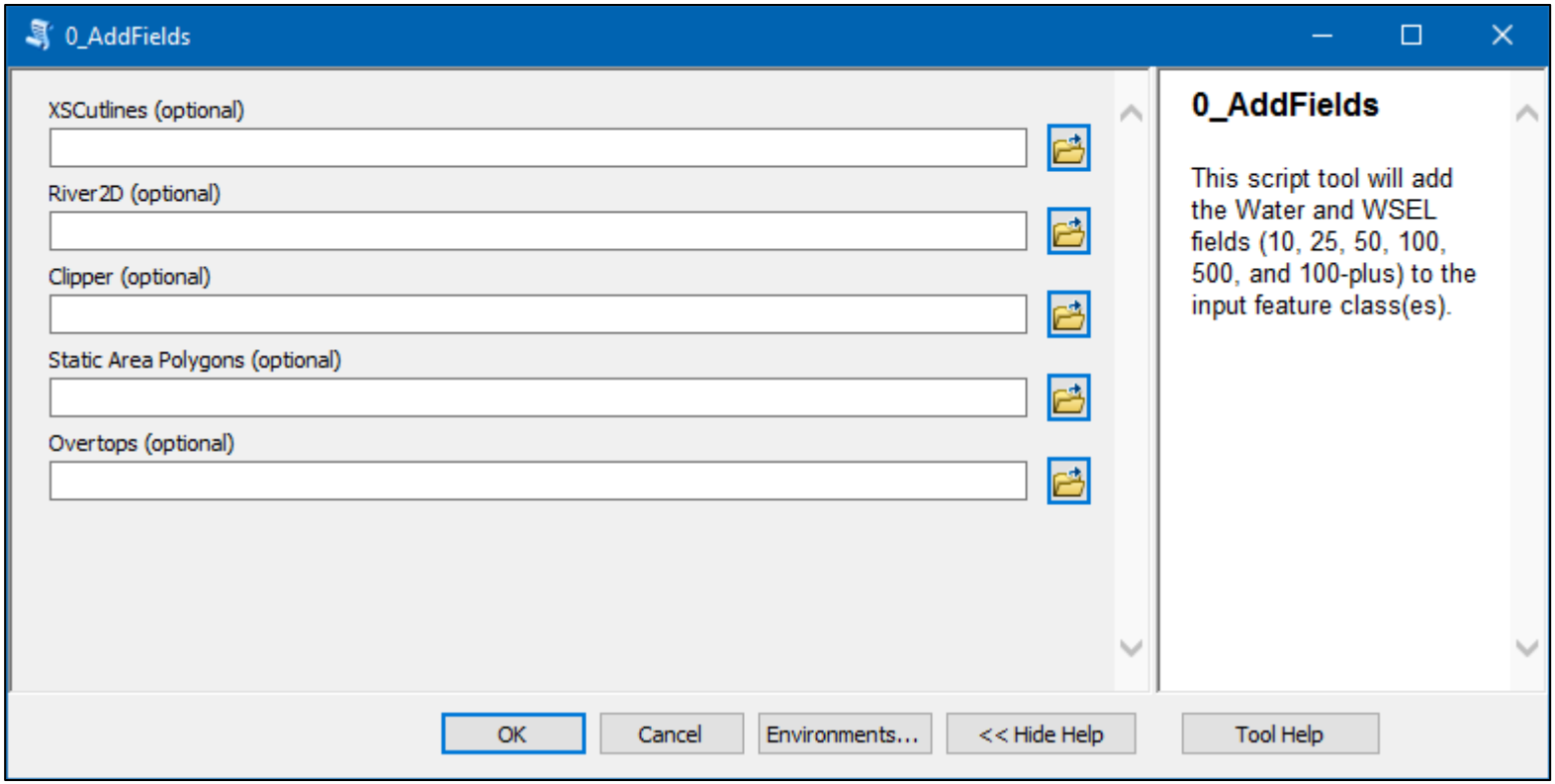
Super Simple Stream

One stream, only cross sections



Preparing Script Tool Inputs

Run “0_AddFields” tool



Preparing Script Tool Inputs

Attribute New Fields

Cross Sections

XSCutlines

	Water	WSEL_10	WSEL_25	WSEL_50	WSEL_100	WSEL_500	WSEL_100P	FakeXS_YN	S
▶	Indian Creek	662.5991	663.1017	663.4337	663.7402	664.379	665.4405	N	
	Indian Creek	663.2186	663.7464	664.0992	664.4274	665.1024	666.2255	N	
	Indian Creek	663.7519	664.3094	664.6804	665.0219	665.7212	666.8784	N	
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	Indian Creek	665.2488	665.6879	665.9979	666.3162	666.9951	668.1378	N	
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	Indian Creek	666.2971	666.8391	667.1956	667.5441	668.2762	669.4804	N	
	Indian Creek	666.6469	667.1901	667.5439	667.8773	668.5851	669.7718	N	
	Indian Creek	667.0397	667.5888	667.945	668.2875	669.0106	670.223	N	

Bounding Polygons

BoundingPolygons

	object identifer *	Water	Shape *
▶	1	Indian Creek	Polygon

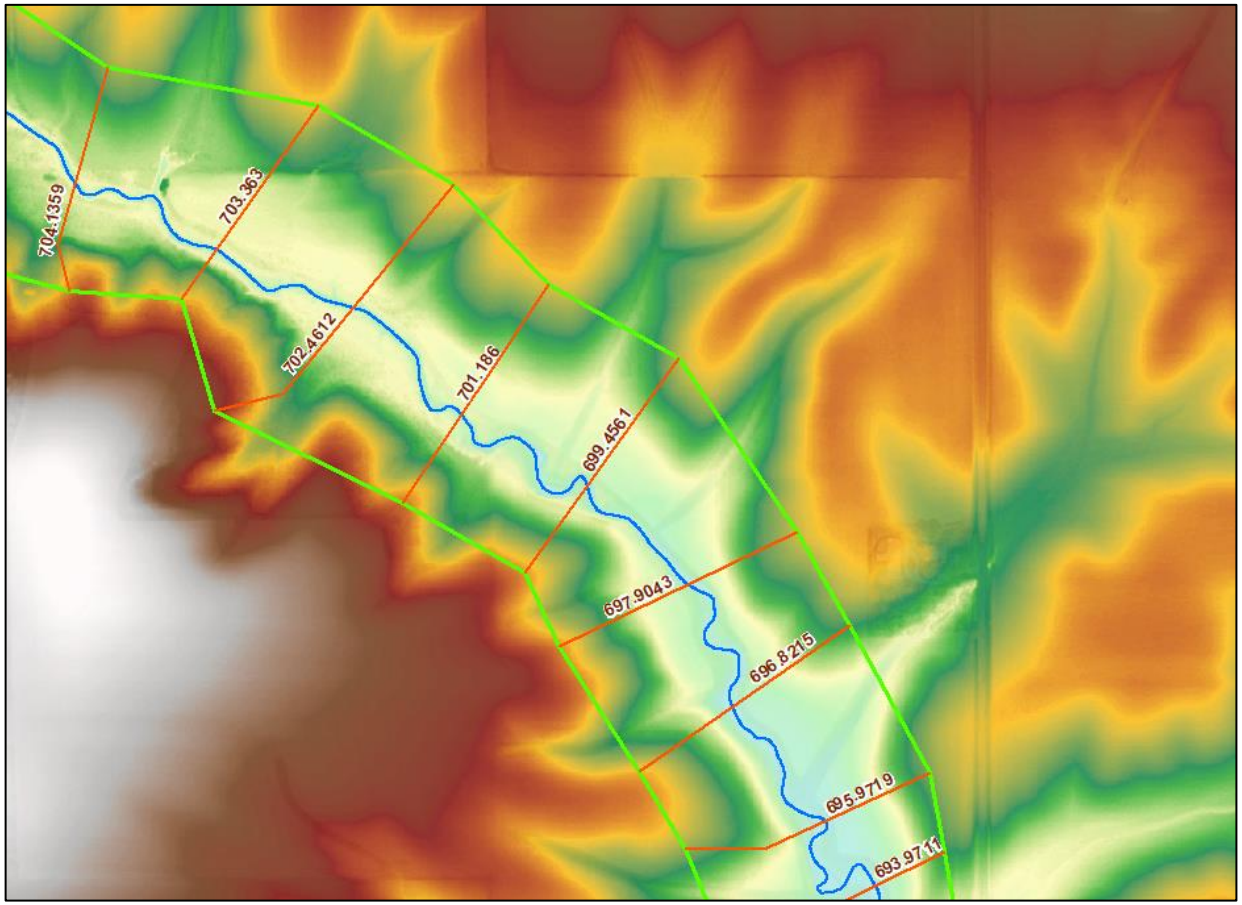
Stream Lines

River2D

	object identifer *	Water	Shape *
▶	3	Indian Creek	Polyline

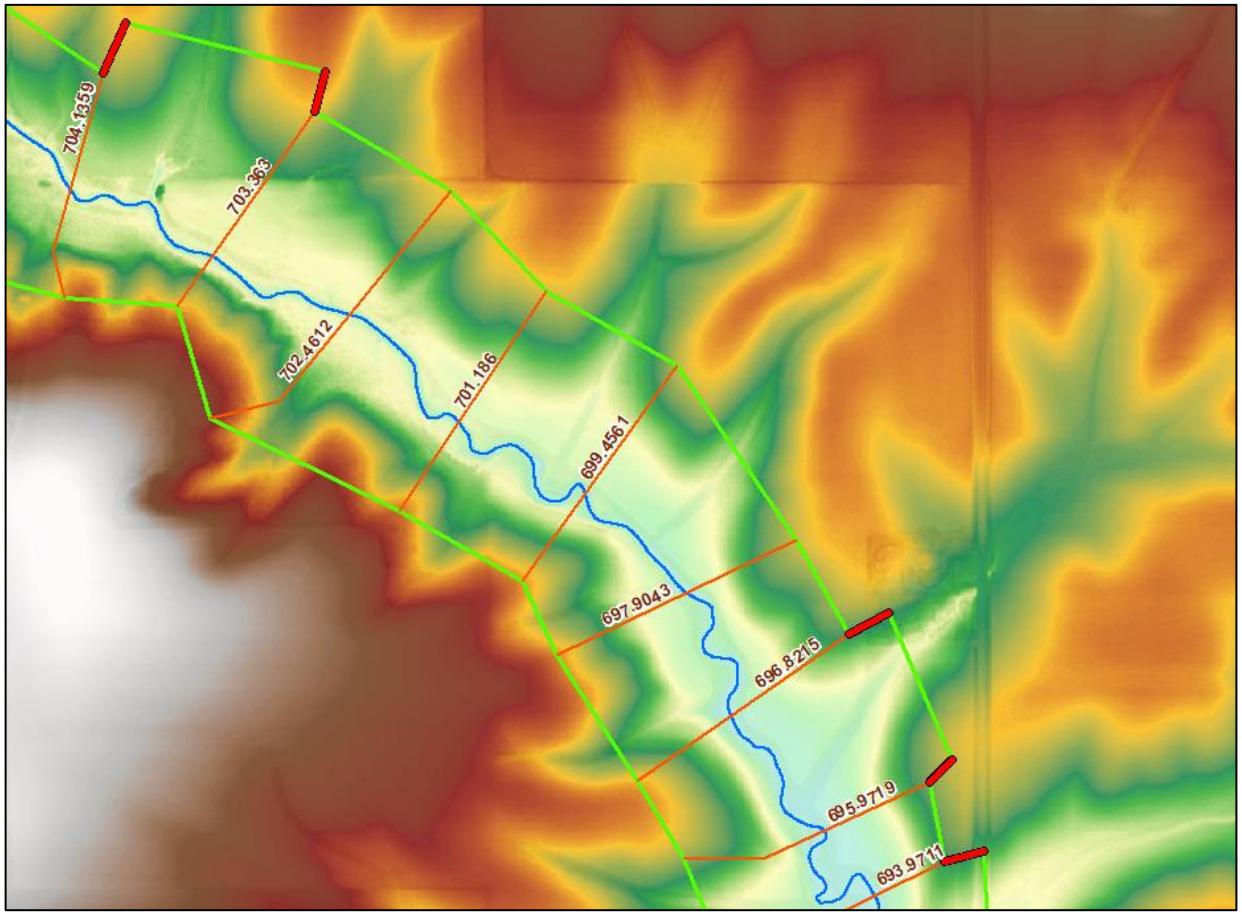
Preparing Script Tool Inputs

Extend Cross Sections where needed

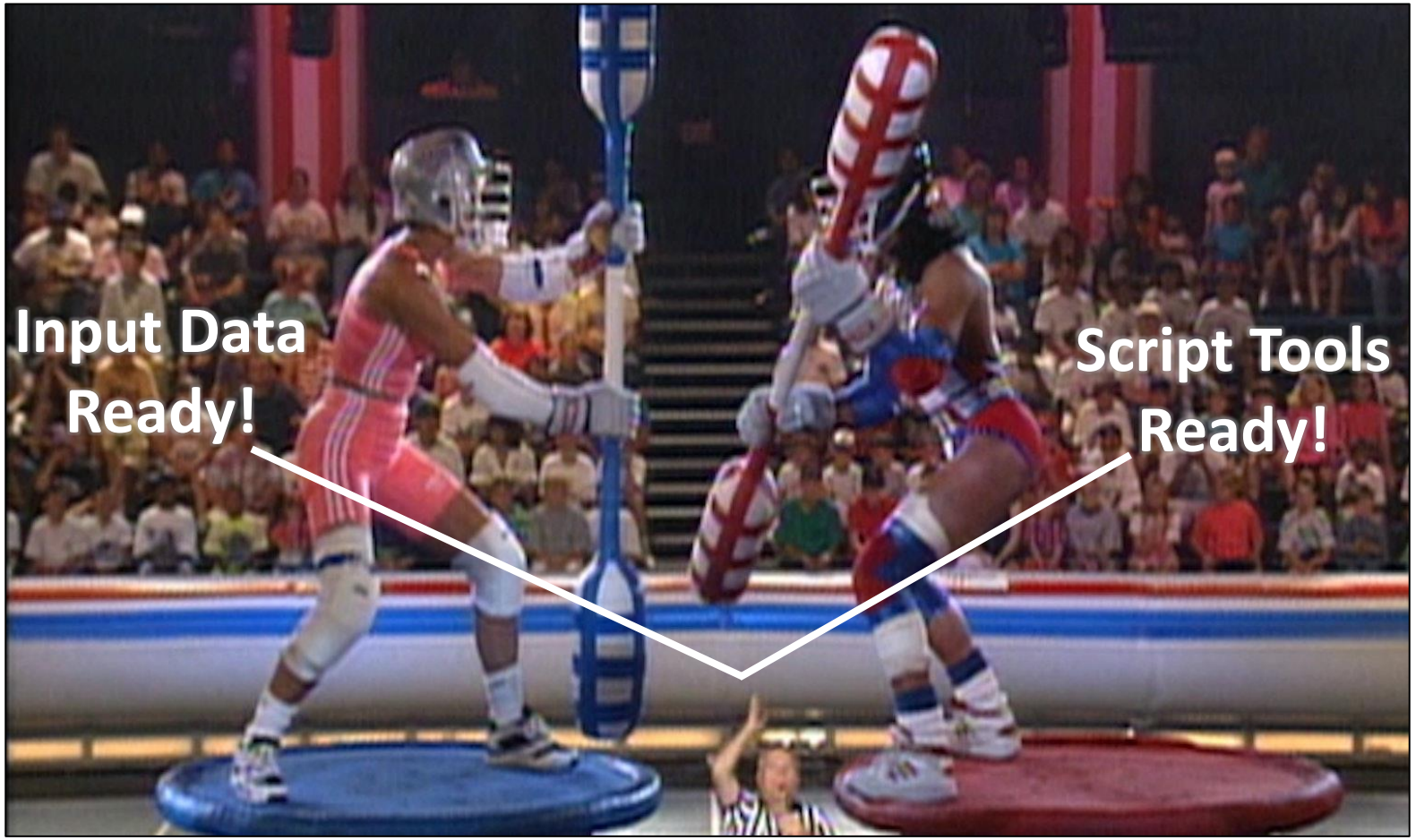


Preparing Script Tool Inputs

Extend Cross Sections where needed

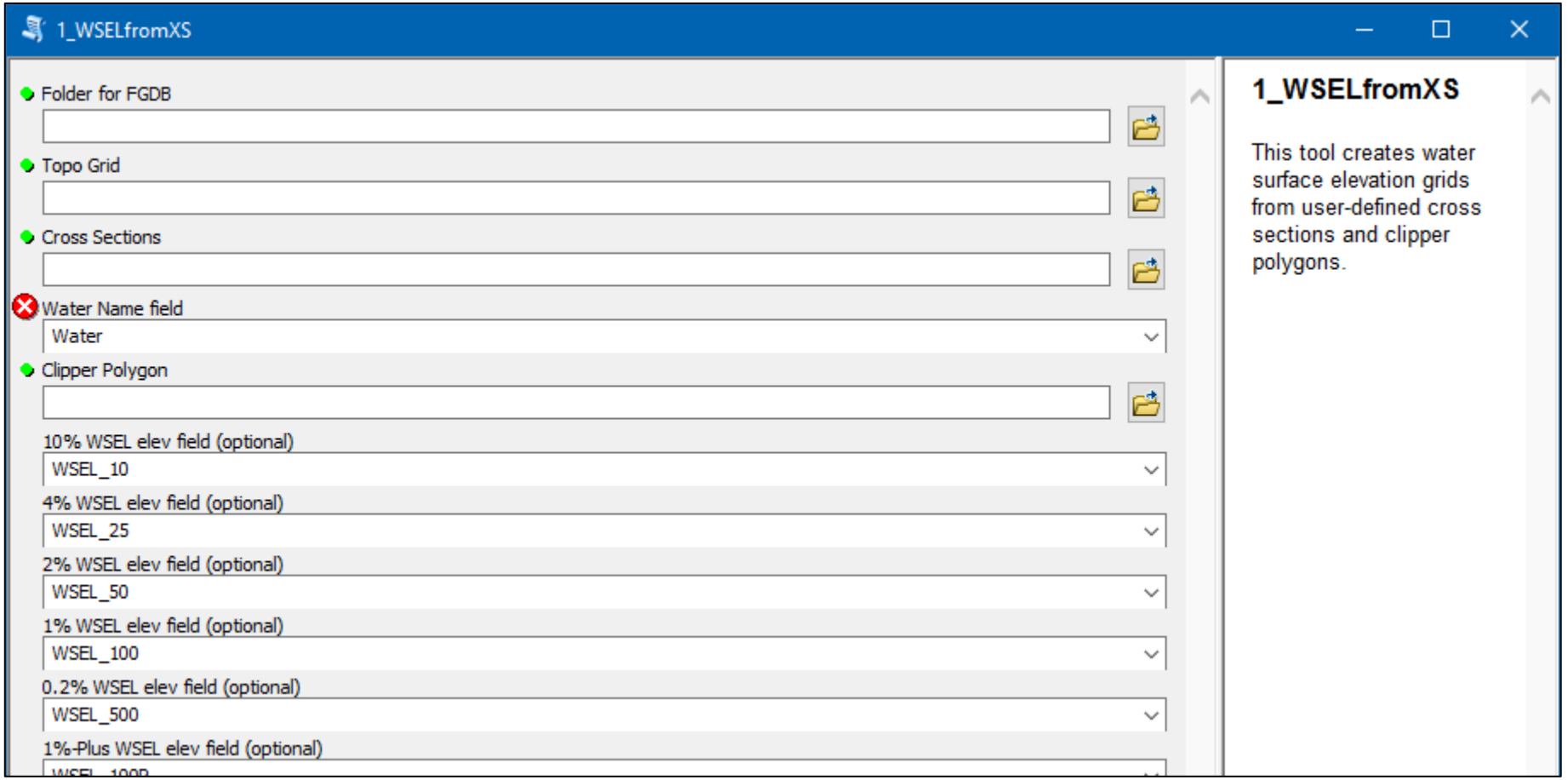


Ready to Go!



Making the WSEl Grid

Dialog Box

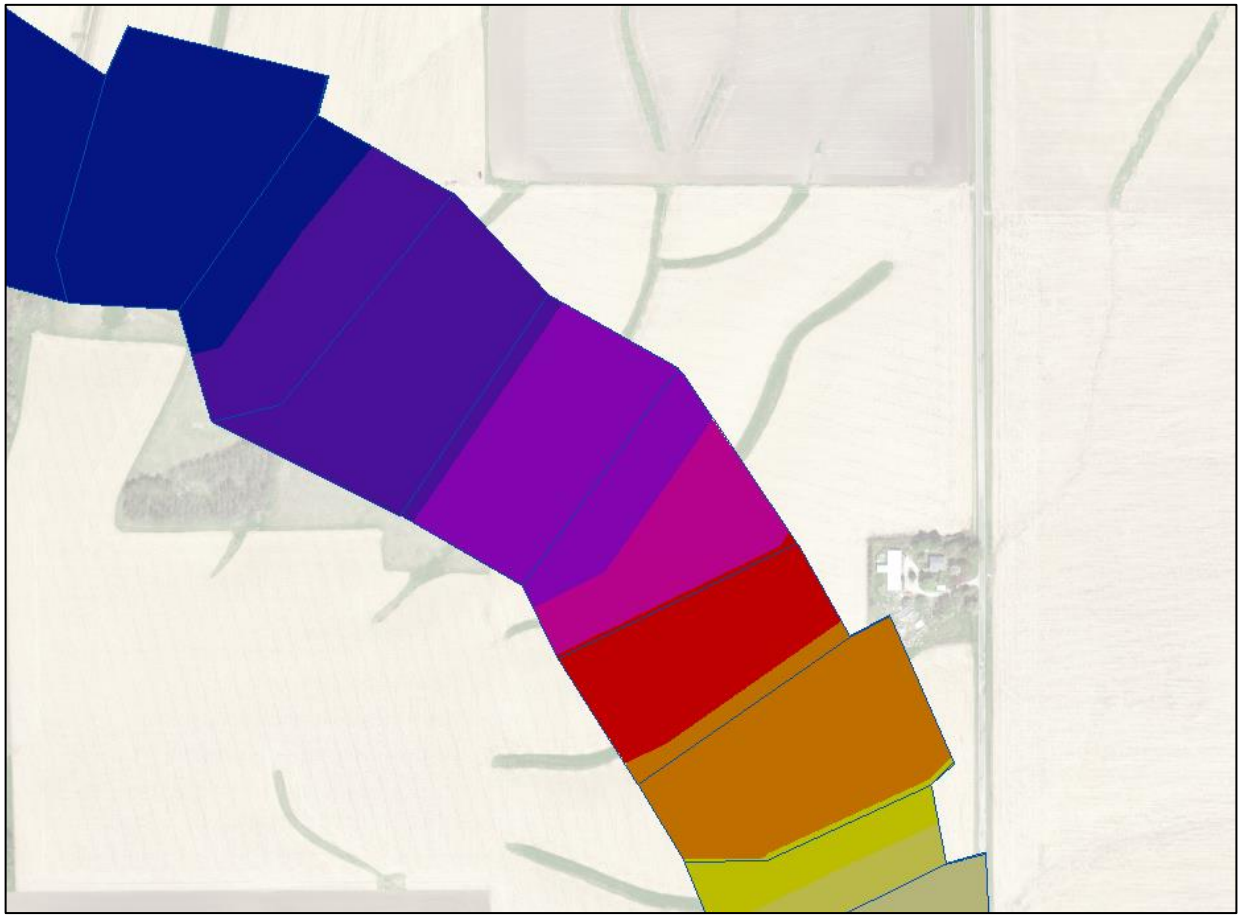


Making the WSEl Grid (1/3)

Extract Stream's Cross Sections

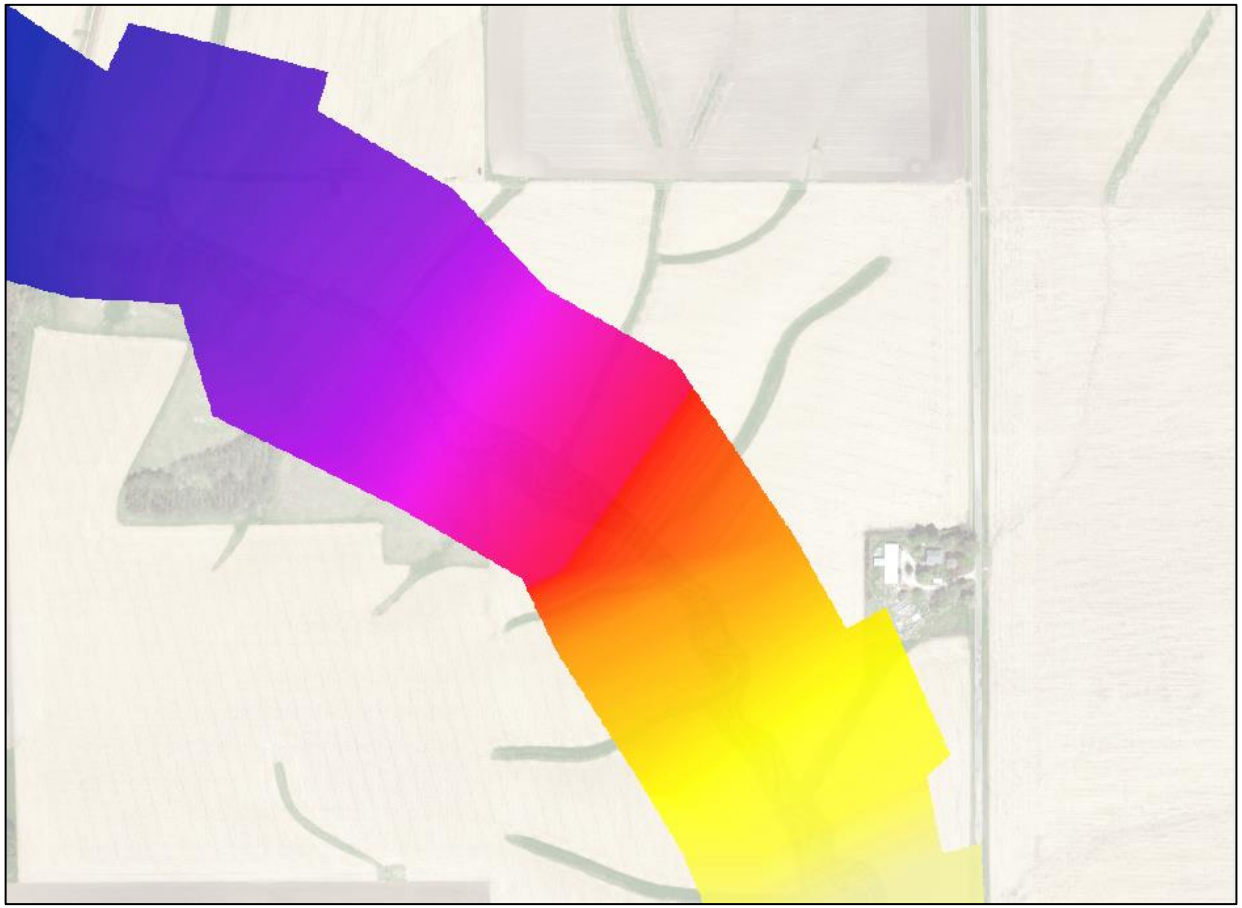
Making the WSEI Grid (2/3)

Create TIN



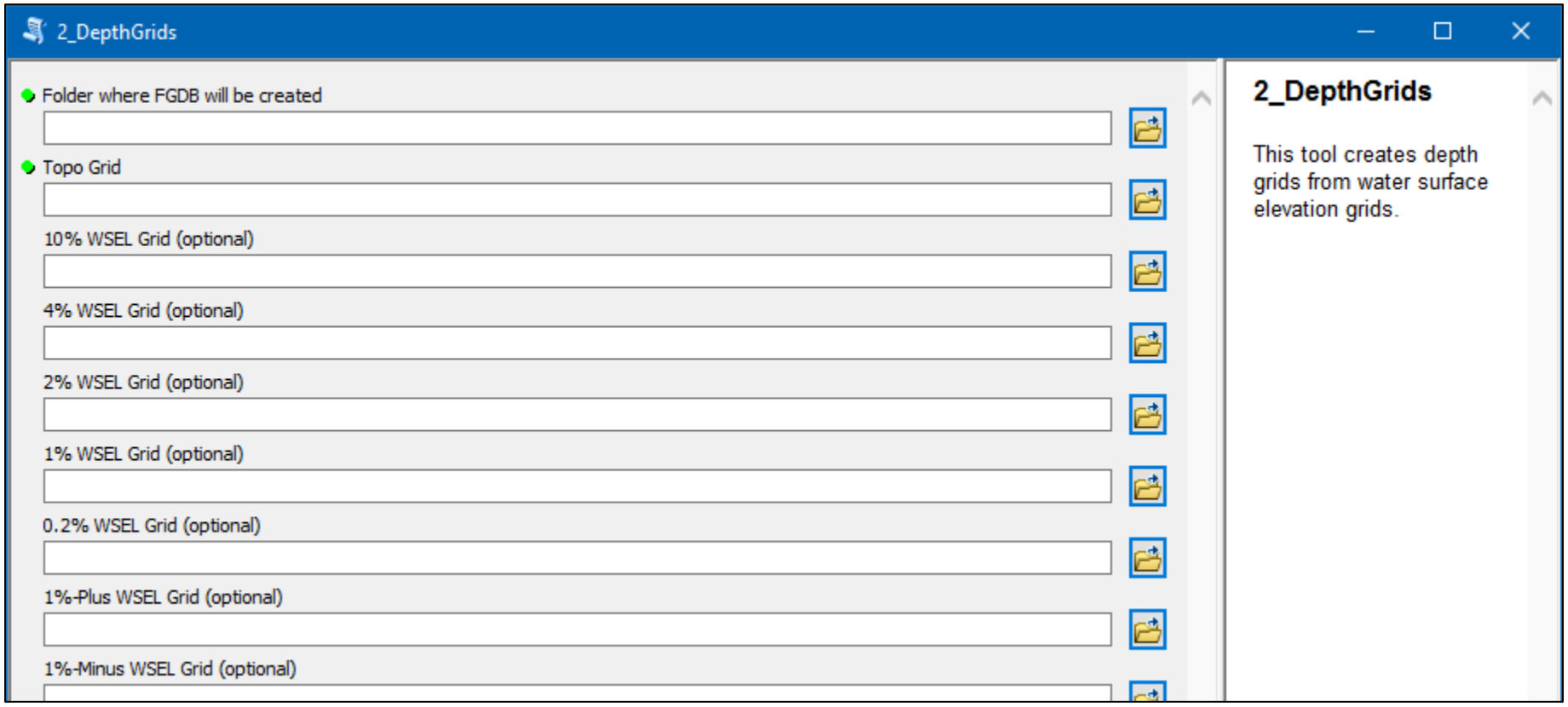
Making the WSEI Grid (3/3)

Convert TIN to Raster



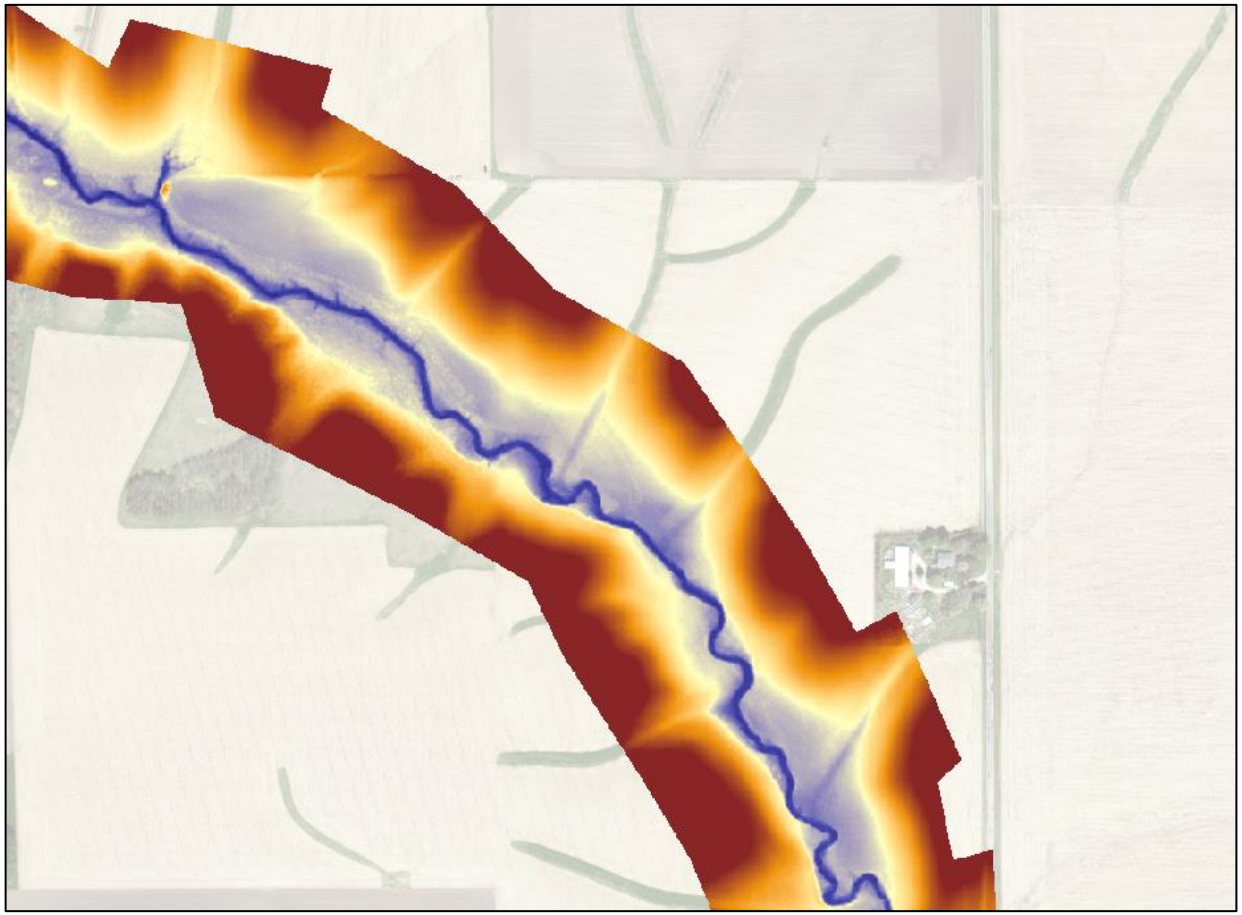
Making the Depth Grid

Dialog Box



Making the Depth Grid (1/2)

Subtract Topo from WSEl

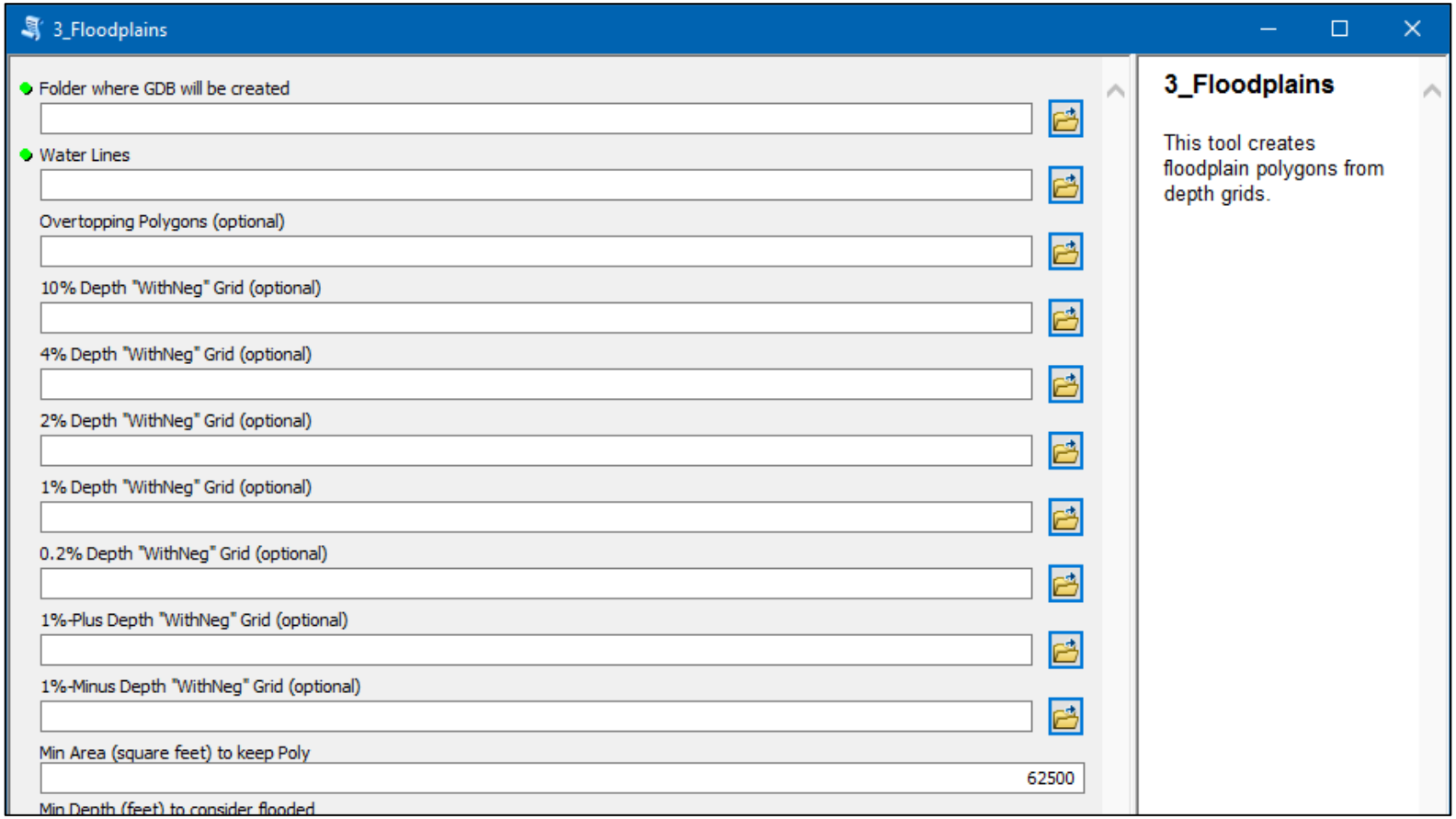


Making the Depth Grid (2/2)

Set negative values to Null

Making the Floodplains

Dialog Box



Making the Floodplains (1/6)

Reclassify to binary (0 or 1)

Making the Floodplains (2/6)

Boundary Clean

Making the Floodplains (3/6)

Convert to Polygon

Making the Floodplains (4/6)

Eliminate Small Polygons

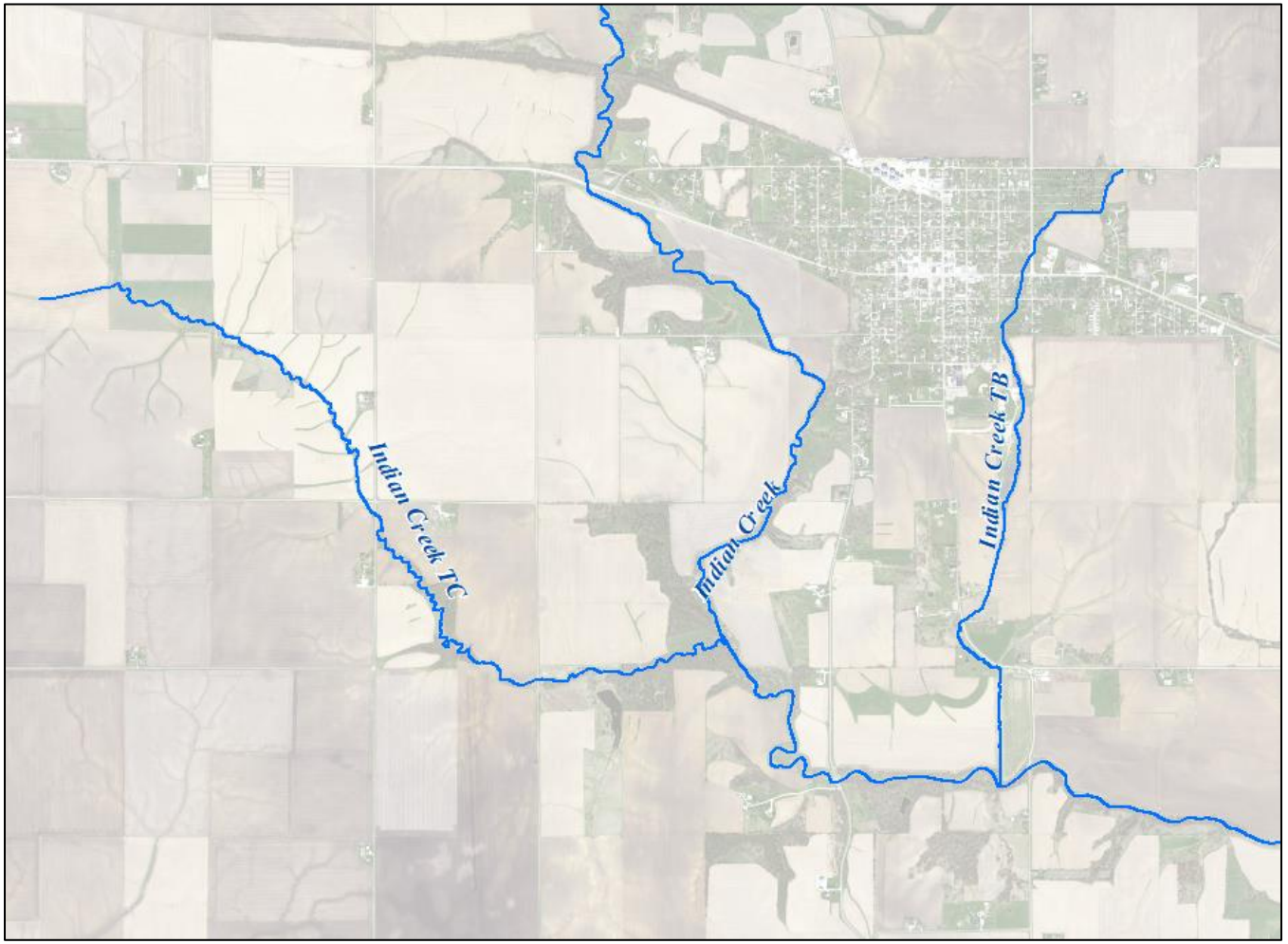
Making the Floodplains (5/6)

Remove Polygons that don't intersect stream

Making the Floodplains (6/6)

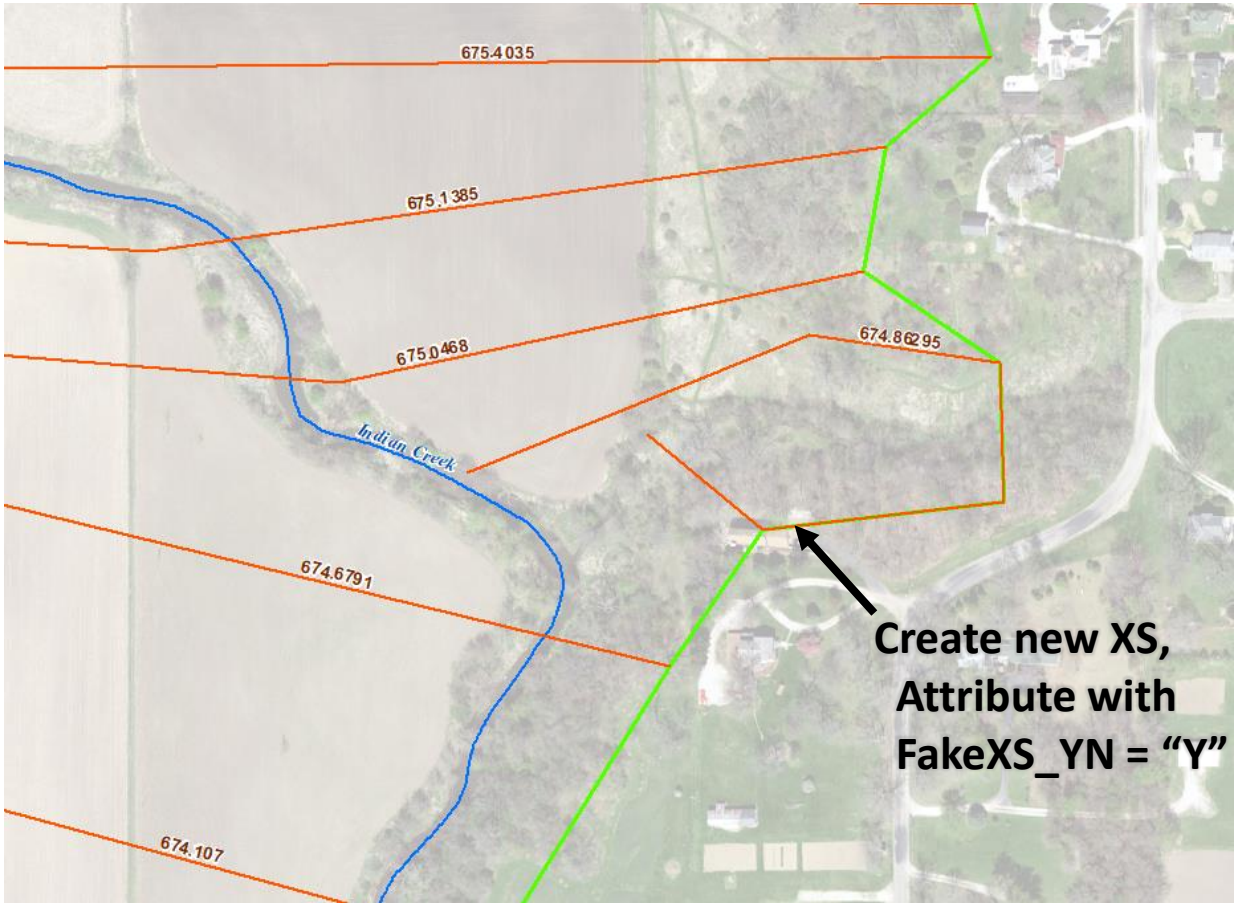
Remove Polygons above WSEl

But What About Tributaries?



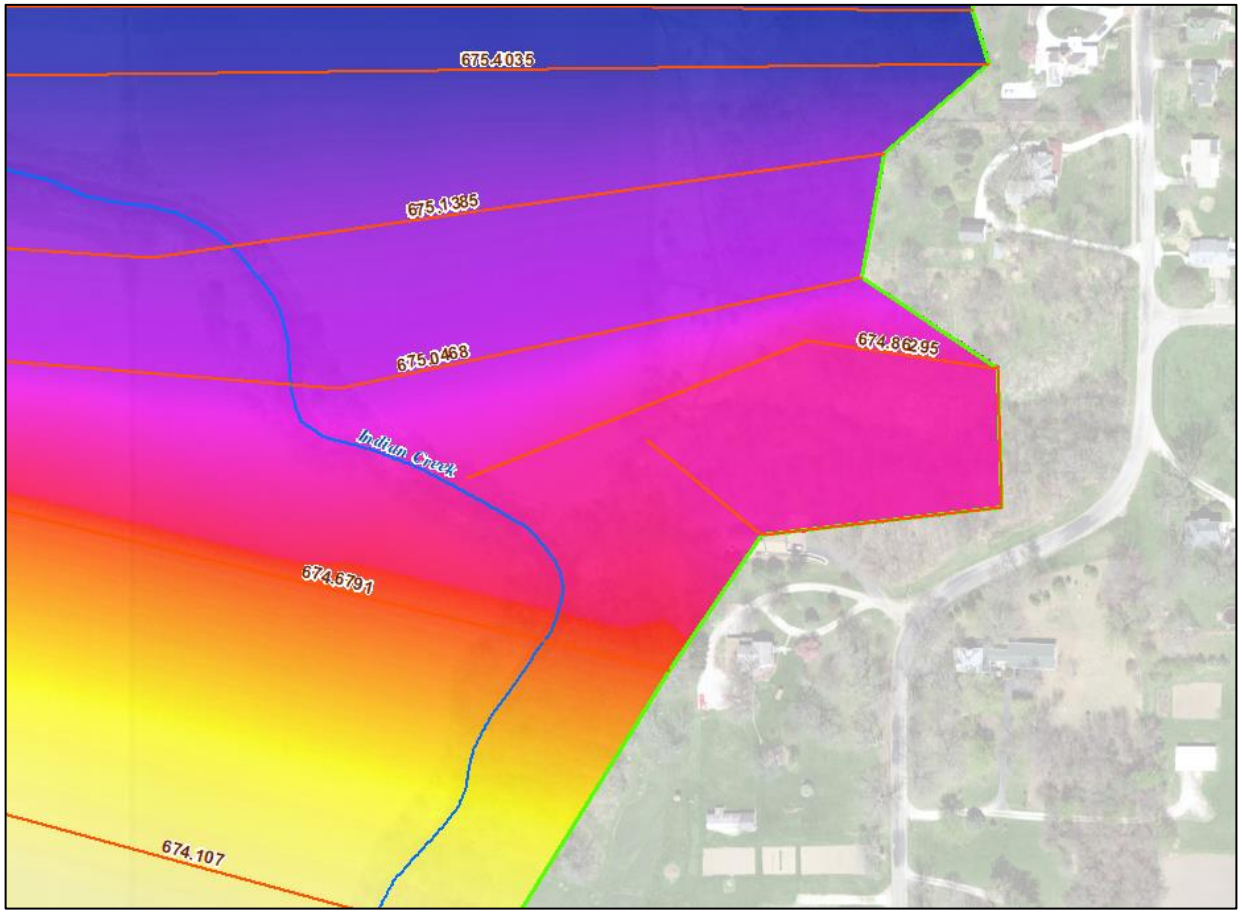
Including Tributaries (1/3)

Not Studied – Lasso w/XS Method



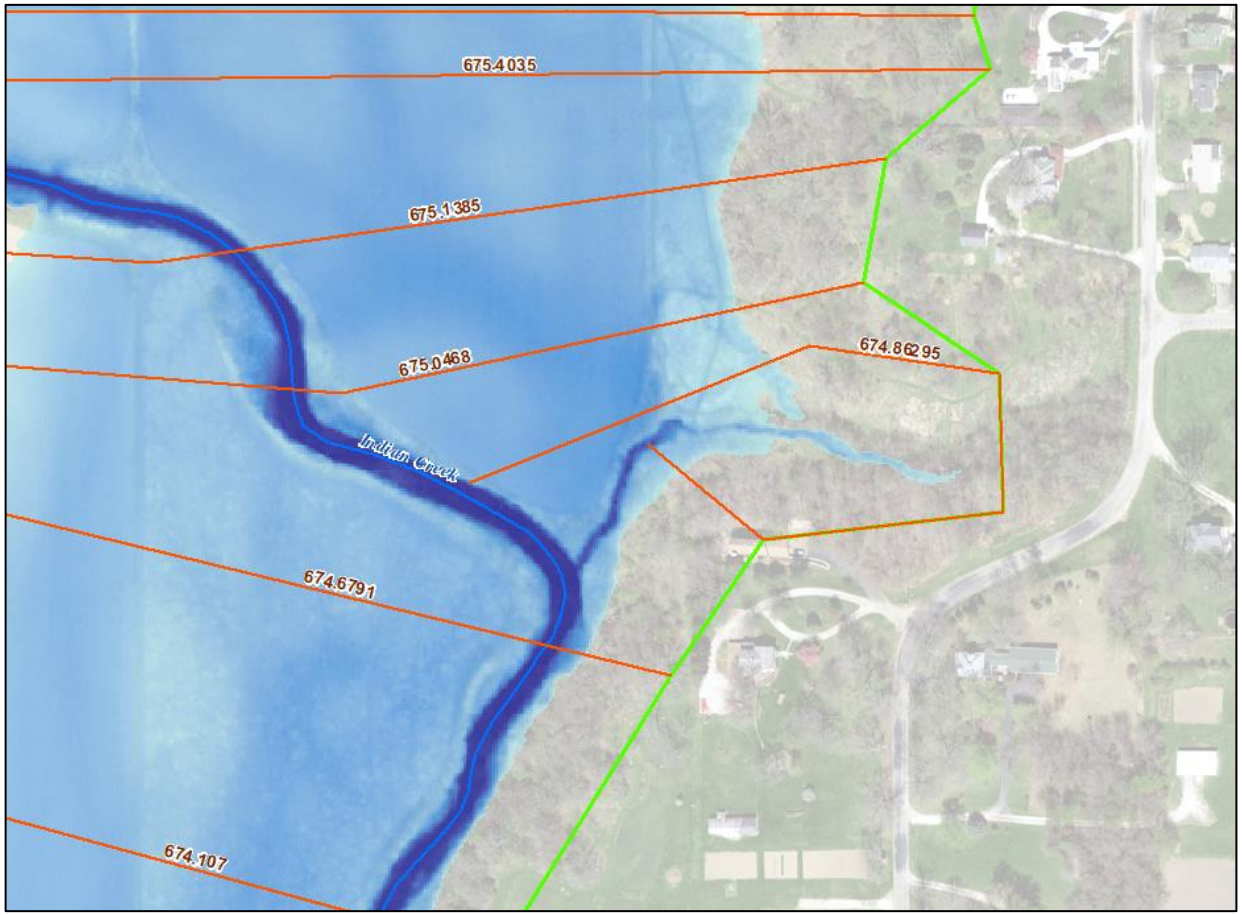
Including Tributaries (1/3)

Not Studied – Lasso w/XS Method



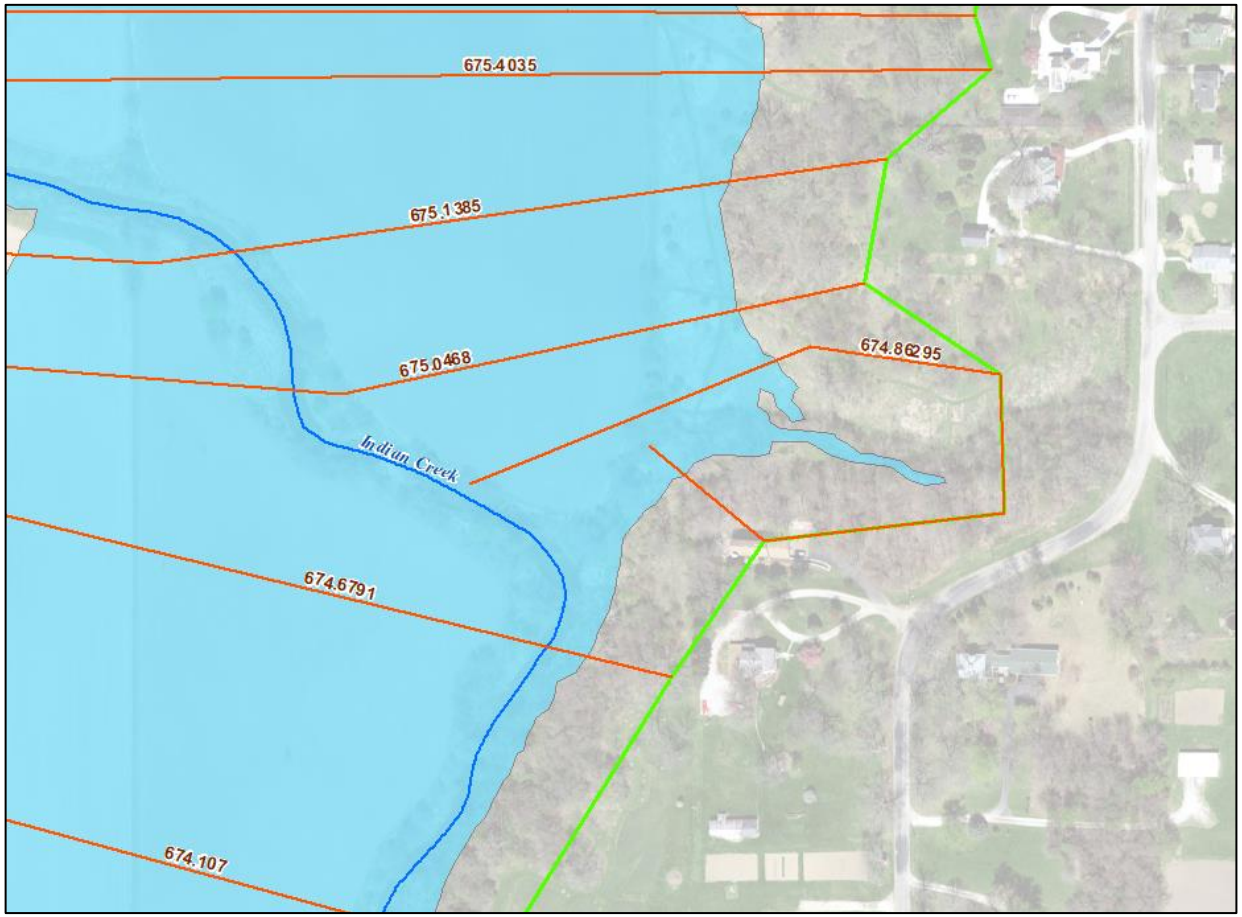
Including Tributaries (1/3)

Not Studied – Lasso w/XS Method



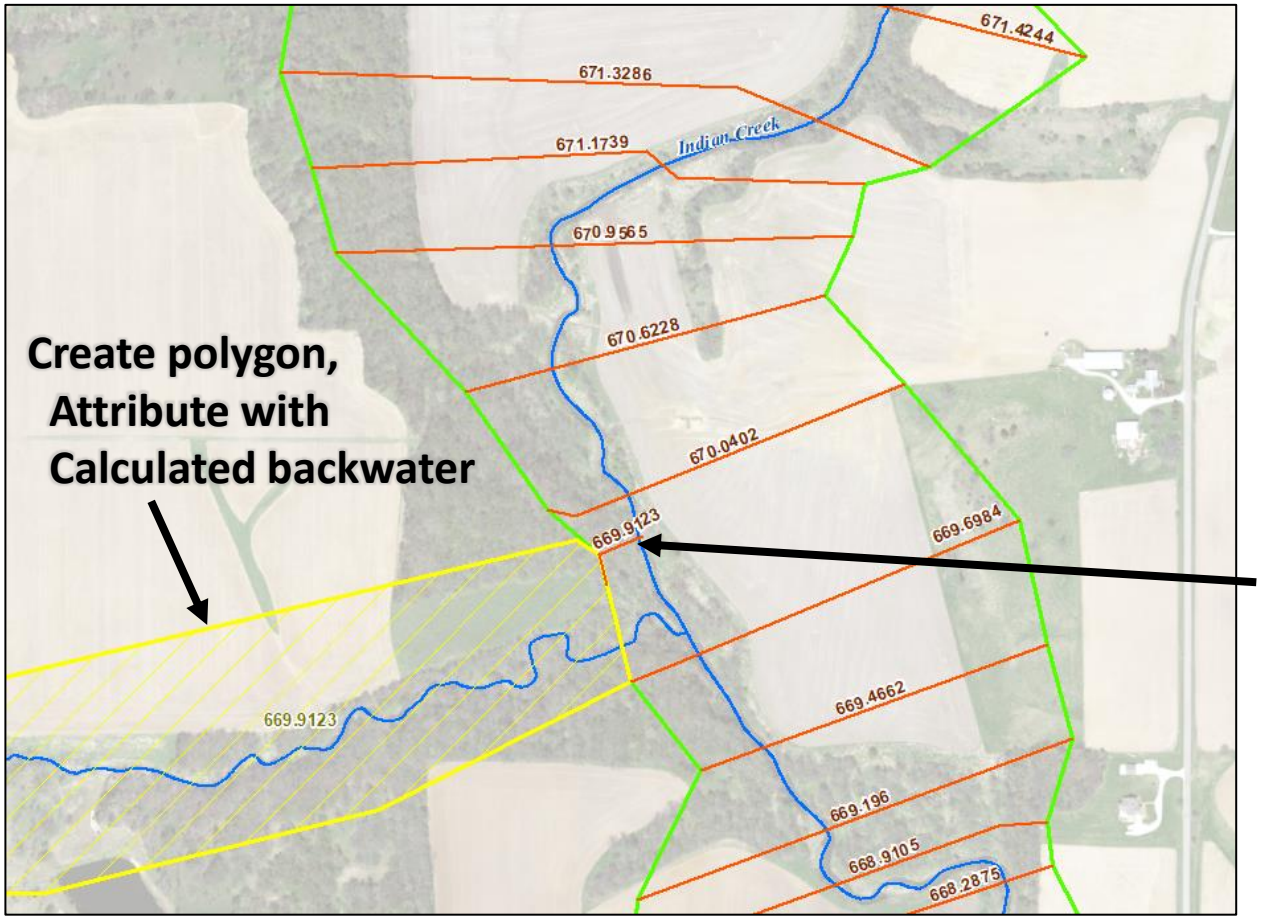
Including Tributaries (1/3)

Not Studied – Lasso w/XS Method



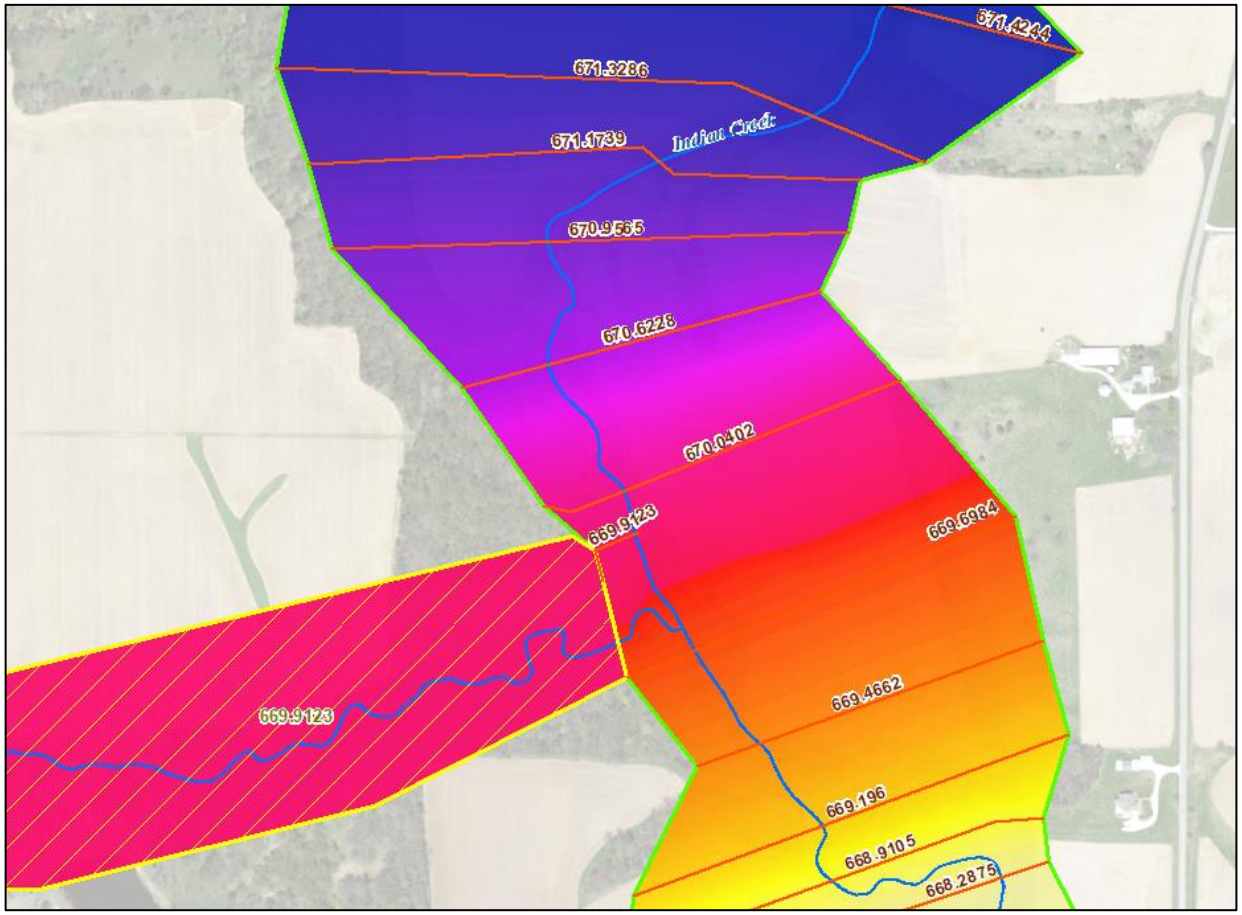
Including Tributaries (2/3)

Not Studied – Static Polygon Method



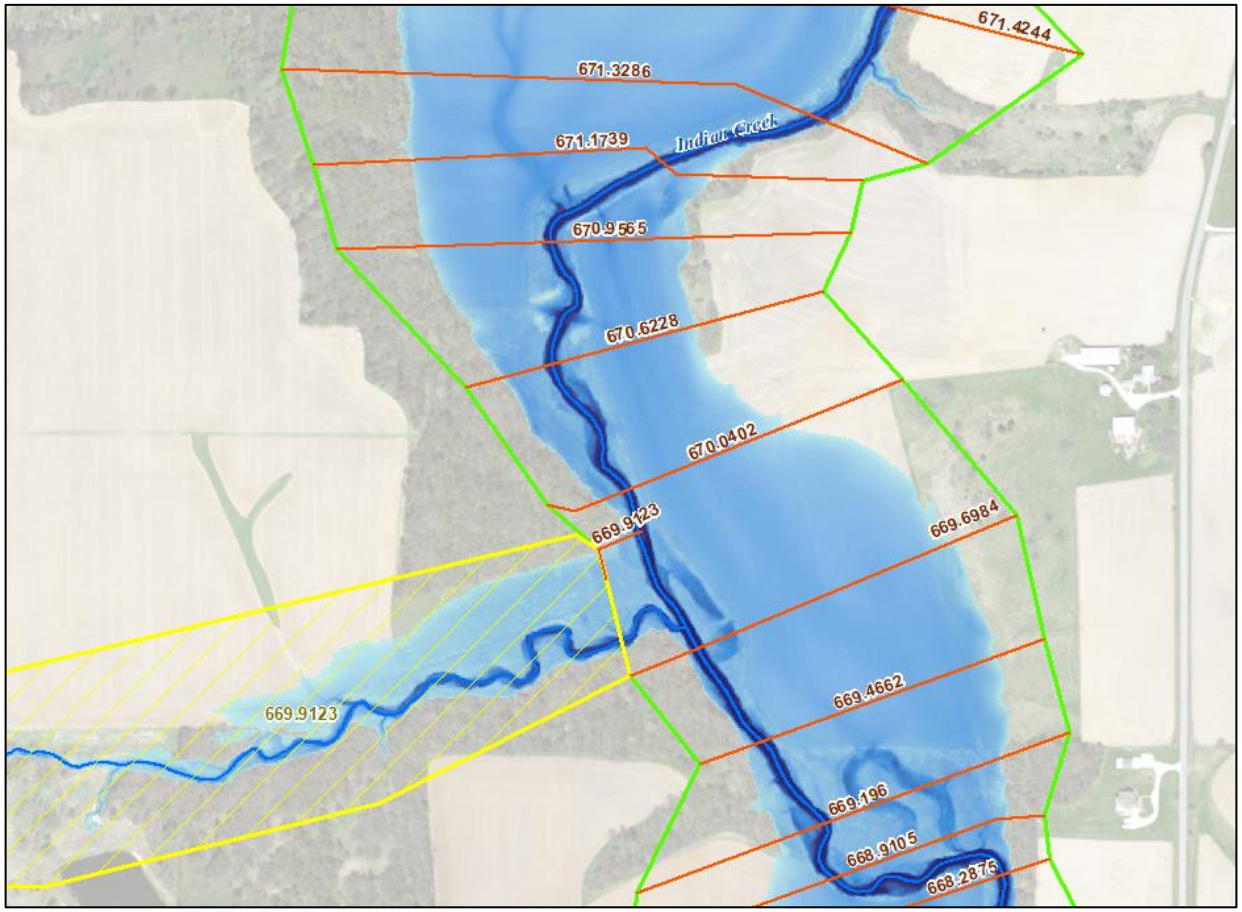
Including Tributaries (2/3)

Not Studied – Static Polygon Method



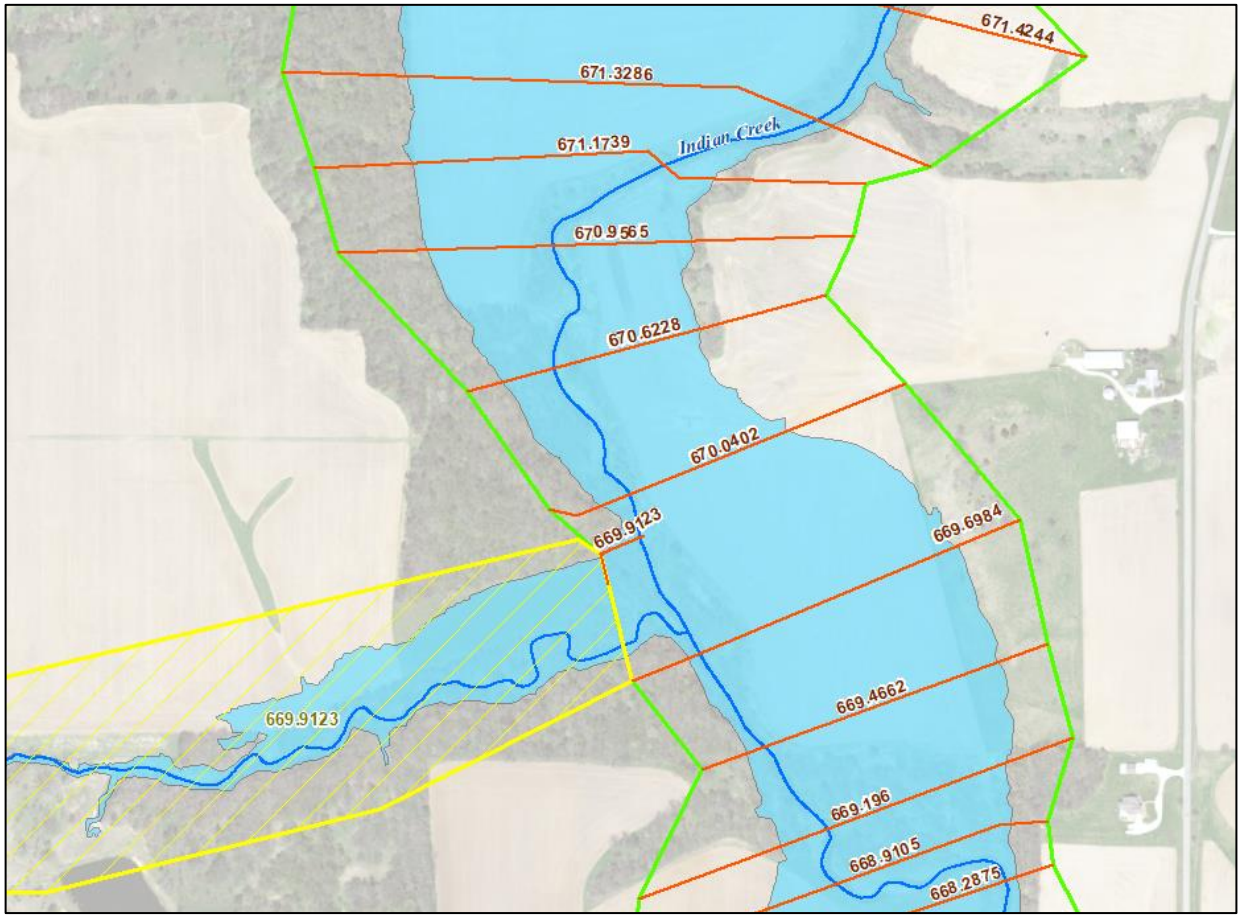
Including Tributaries (2/3)

Not Studied – Static Polygon Method



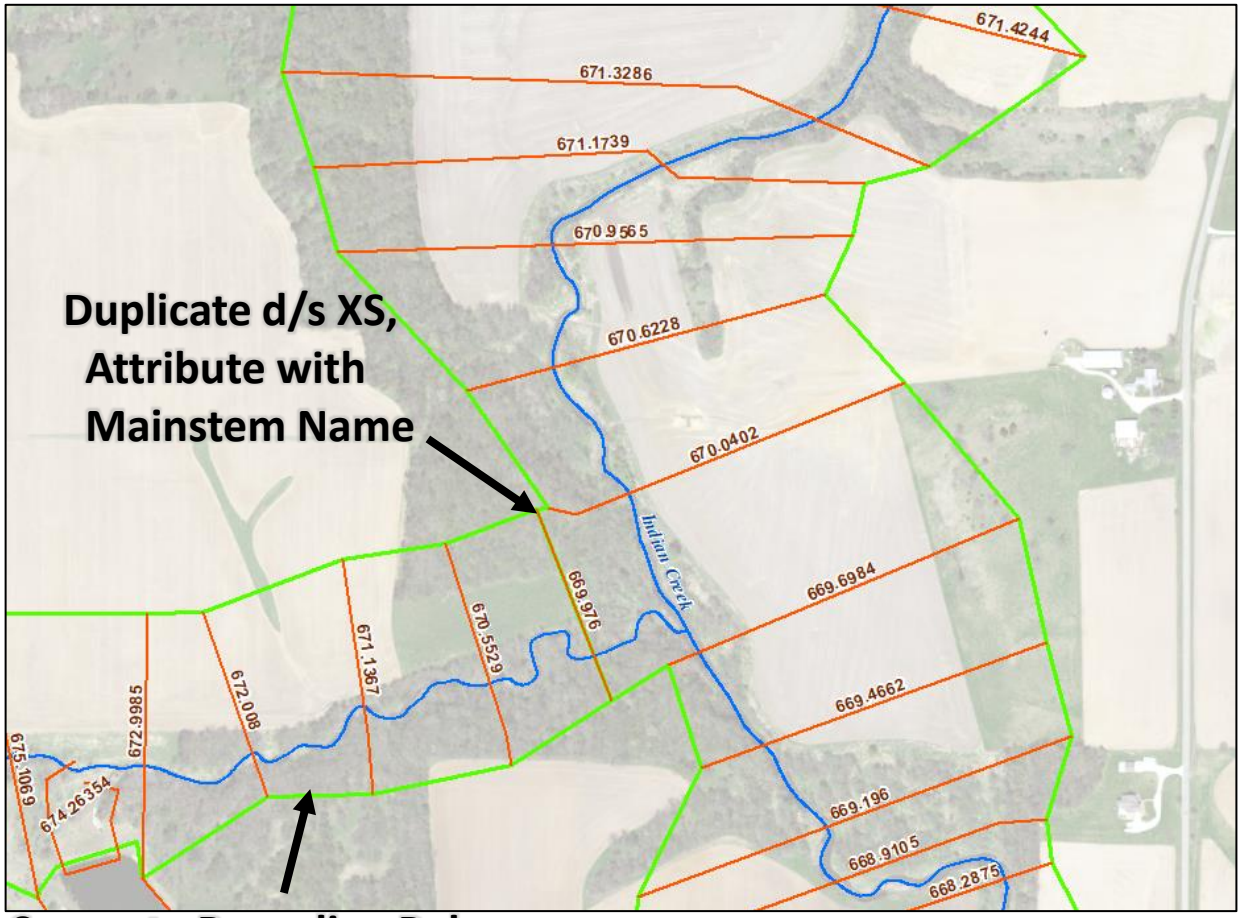
Including Tributaries (2/3)

Not Studied – Static Polygon Method



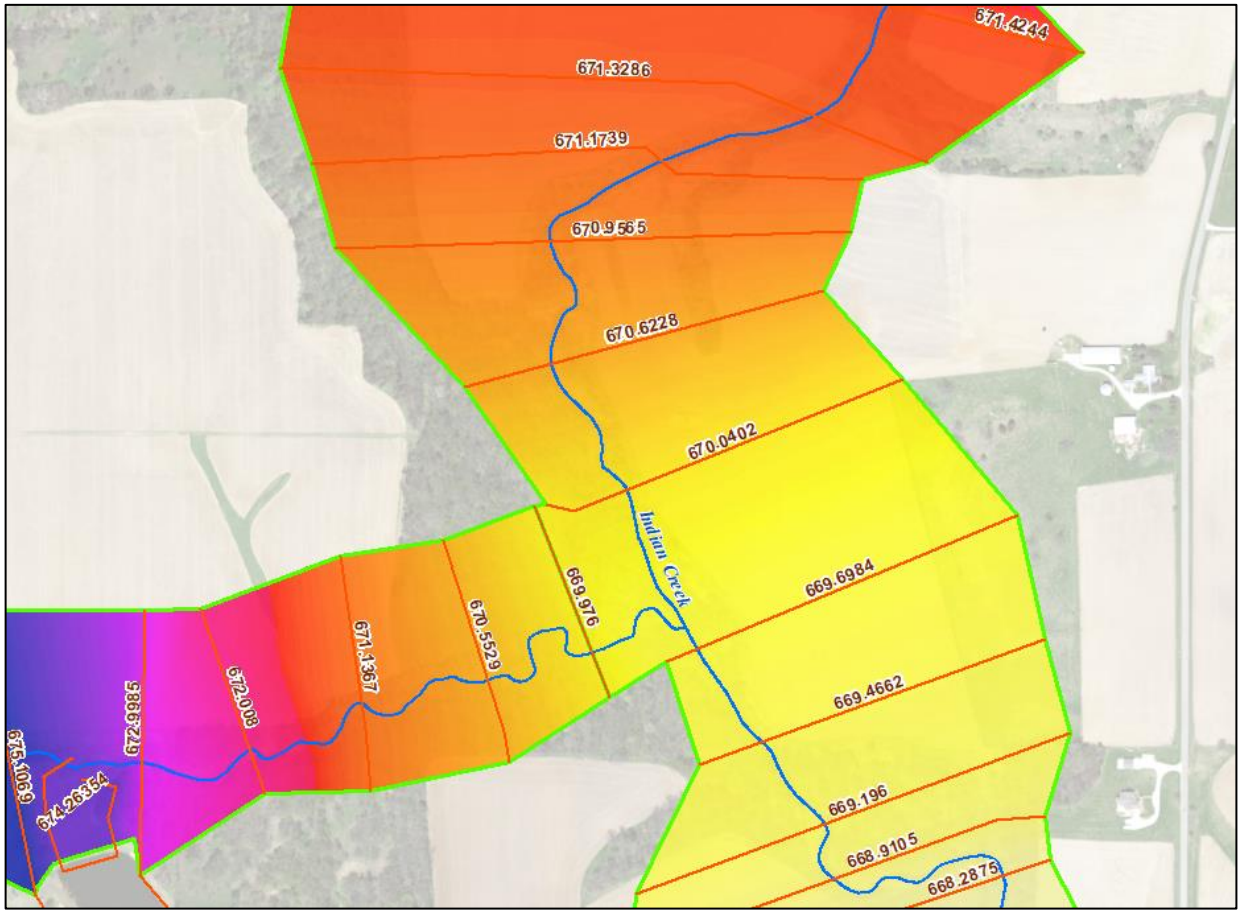
Including Tributaries (3/3)

Tributary modeled as well



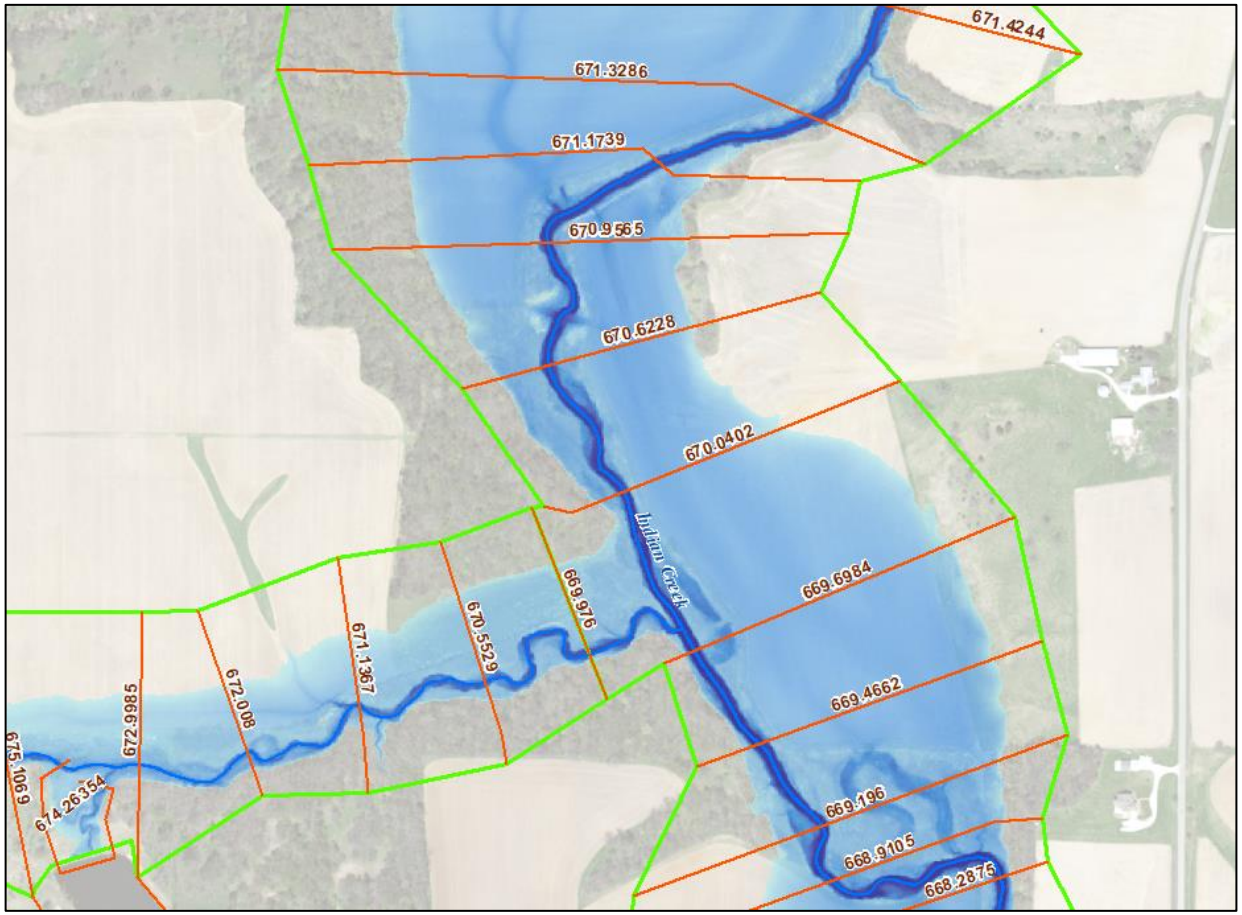
Including Tributaries (3/3)

Tributary modeled as well



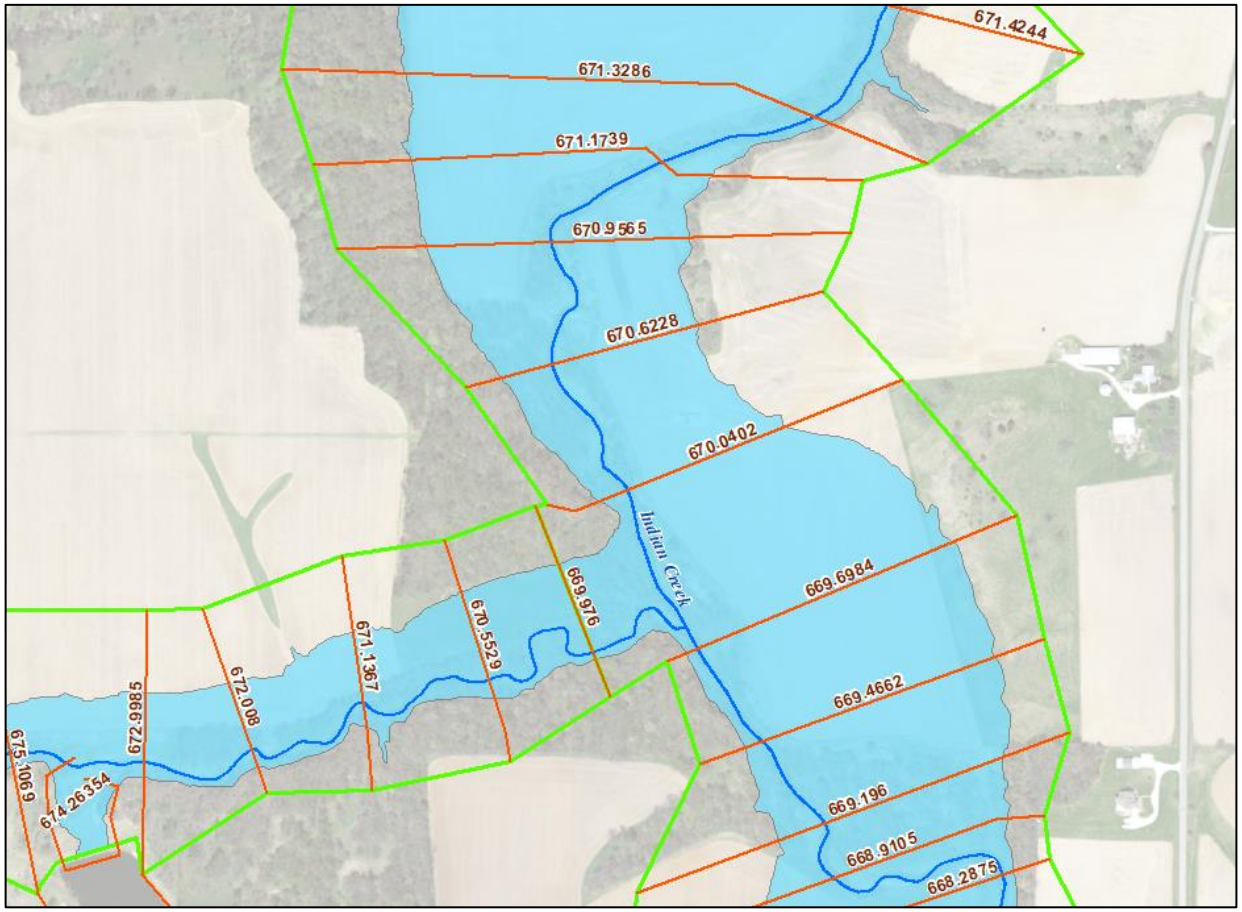
Including Tributaries (3/3)

Tributary modeled as well



Including Tributaries (3/3)

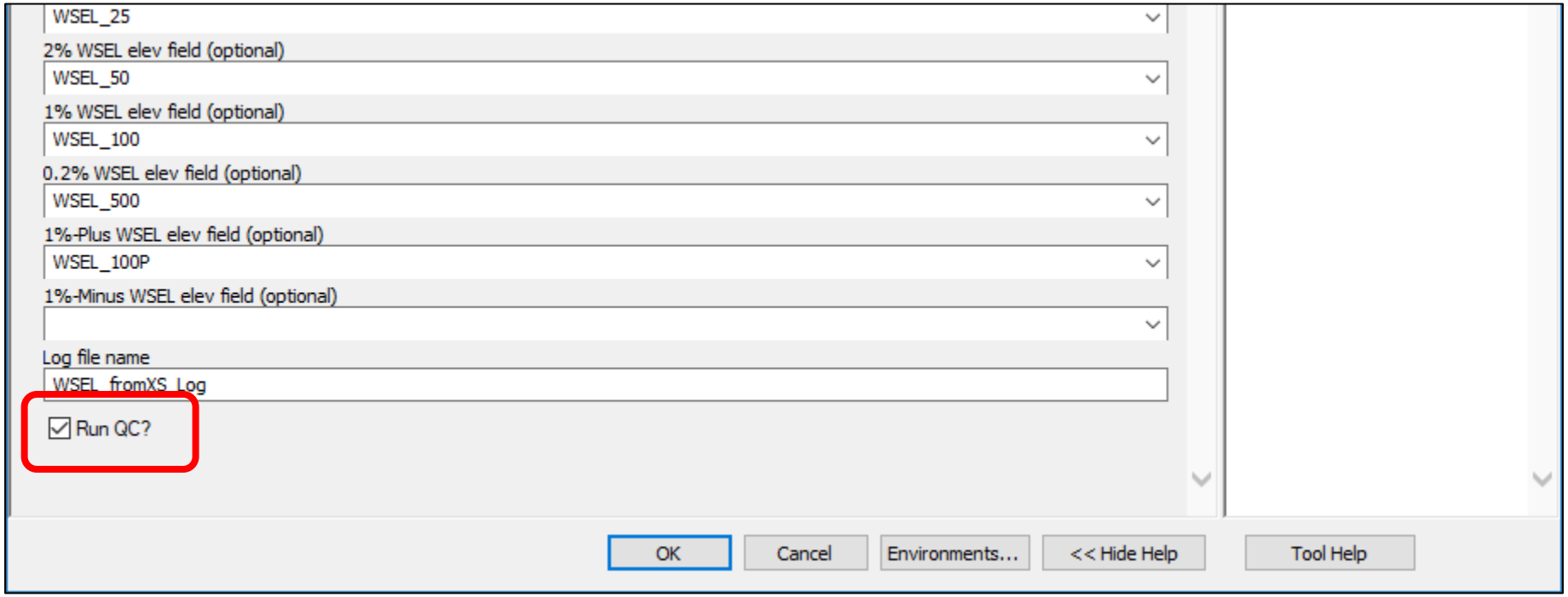
Tributary modeled as well



Great Job! Let's make it better…

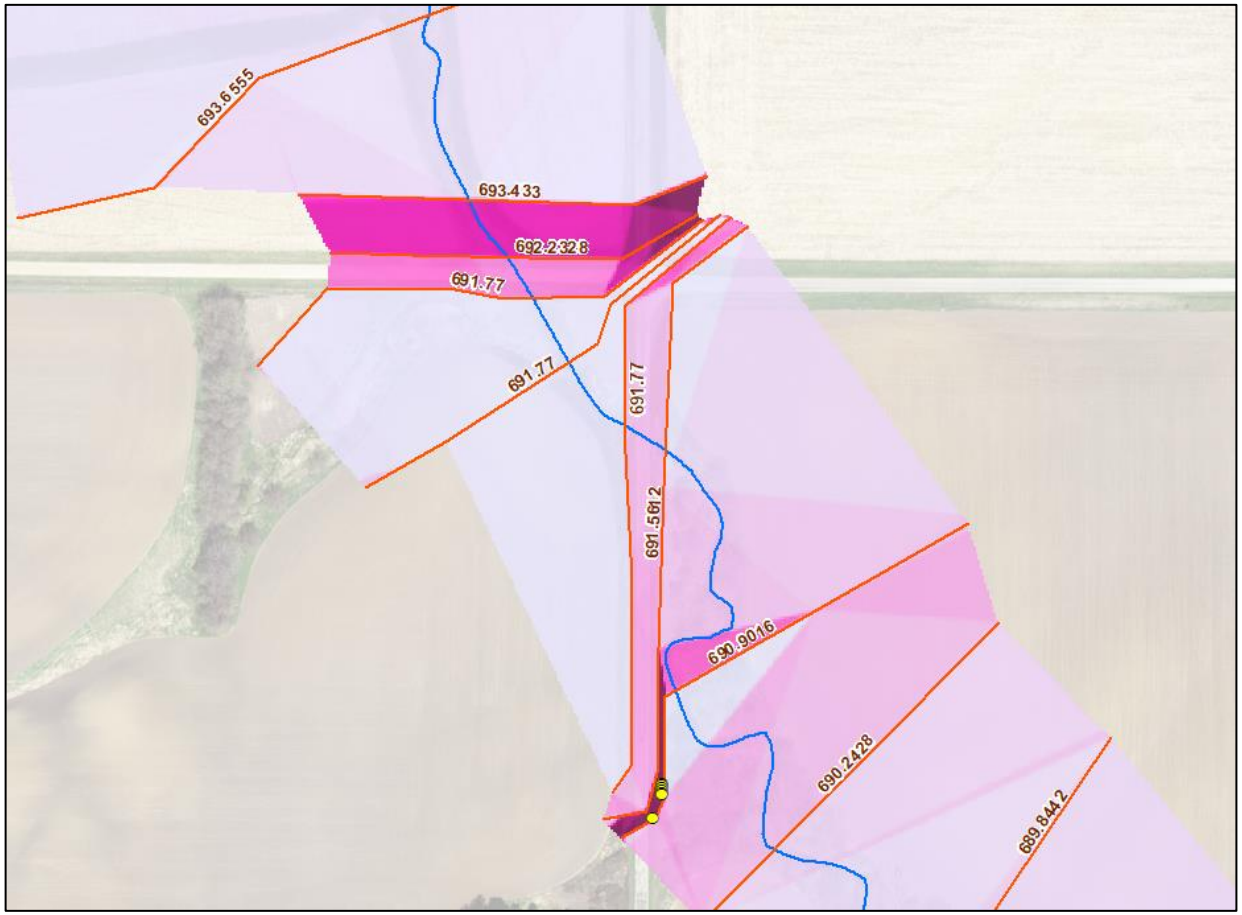
Addition to WSEl Grid Tool

Run QC option



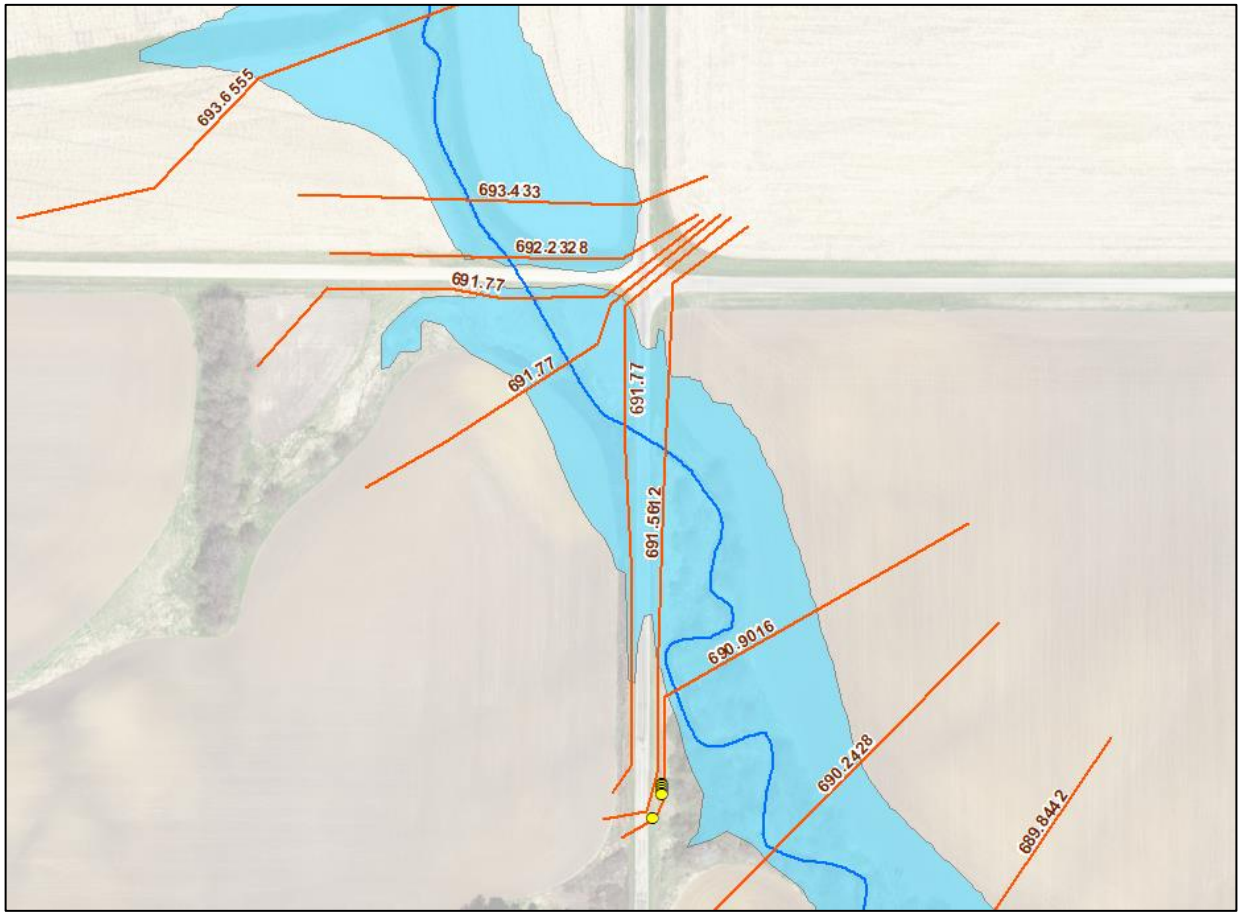
Addition to WSEI Grid Tool

Run QC option – Slope output



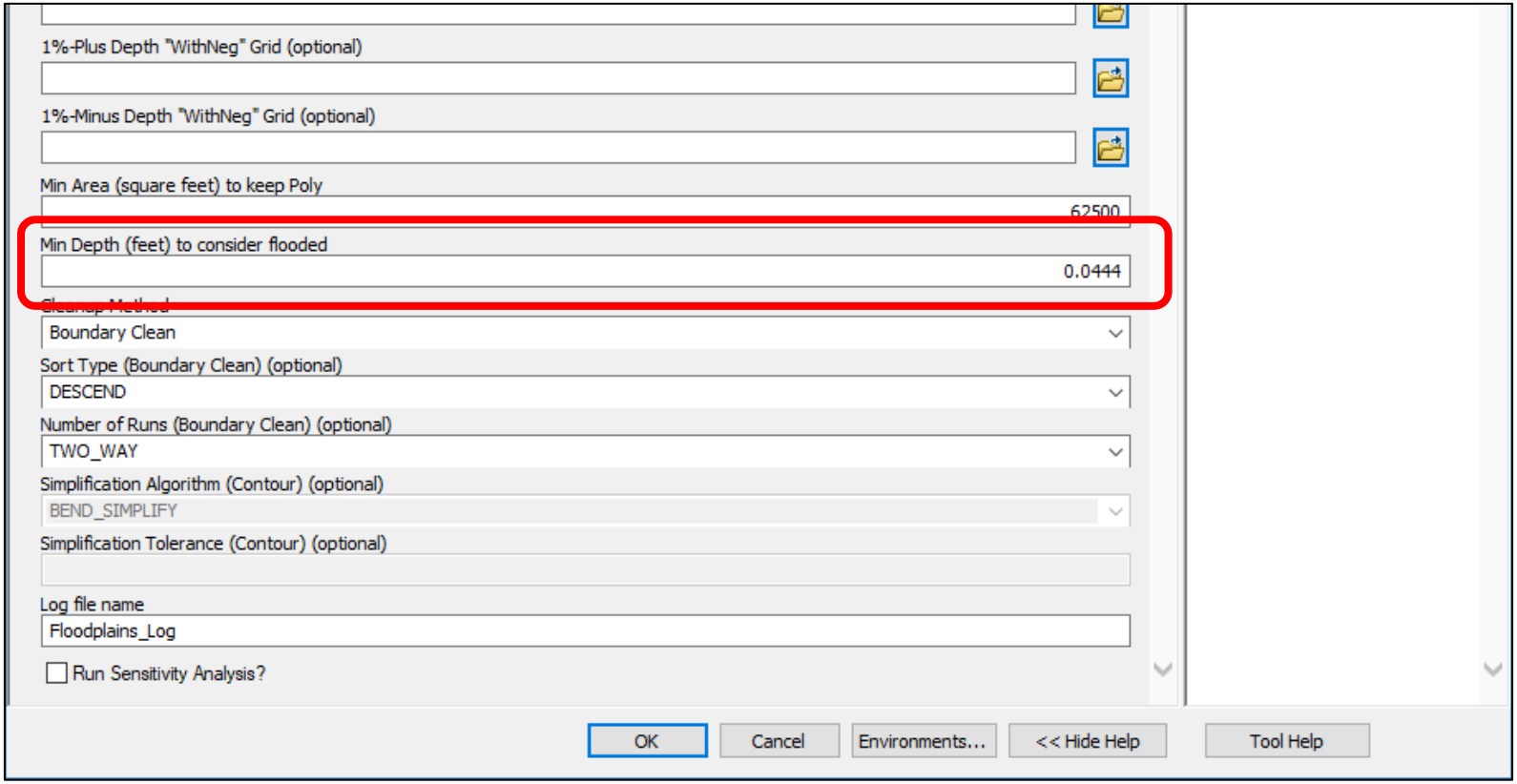
Addition to WSEI Grid Tool

Run QC option – Mismatch Points output



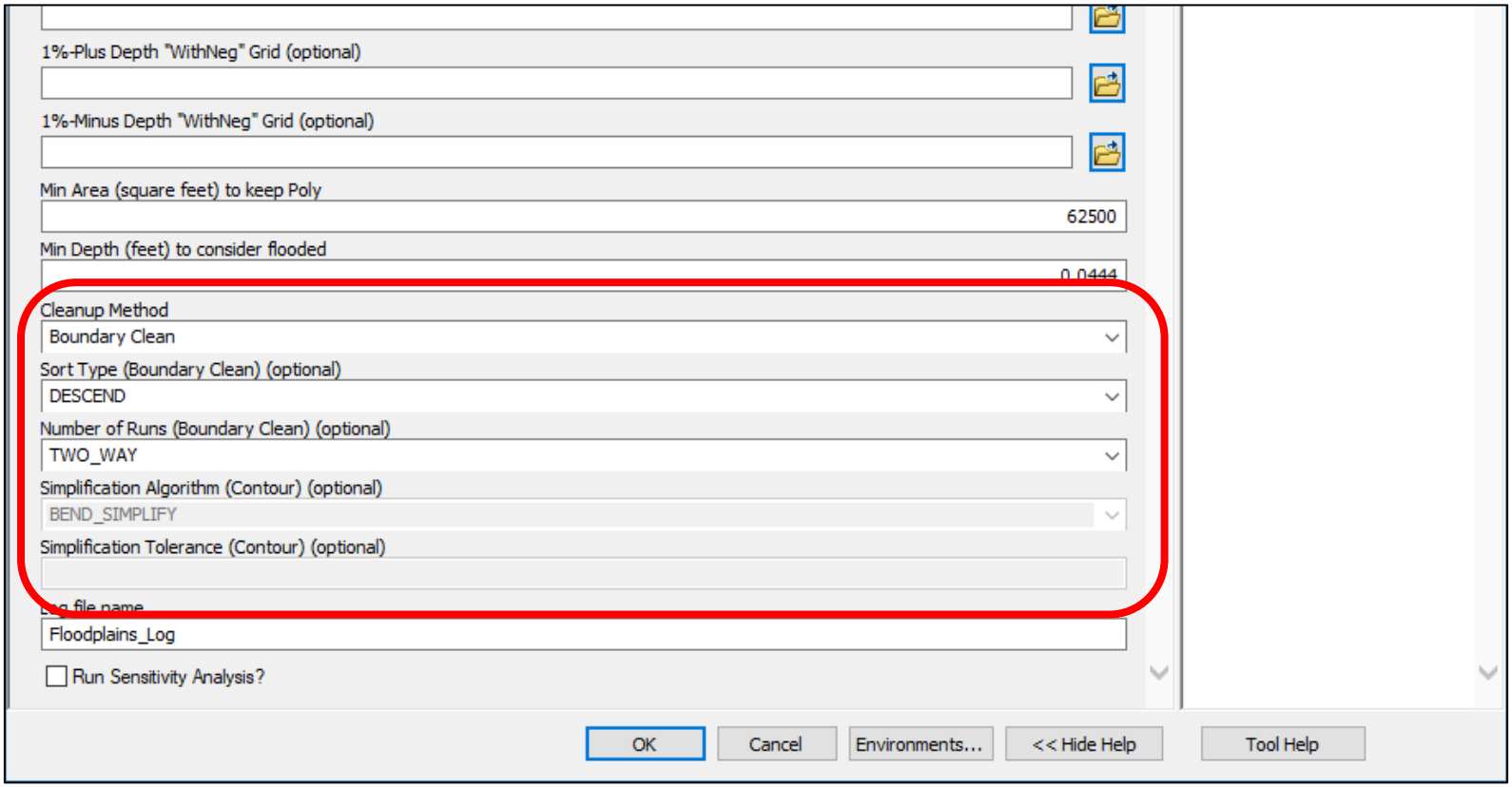
Additions to Floodplains Tool

Minimum Depth option



Additions to Floodplains Tool

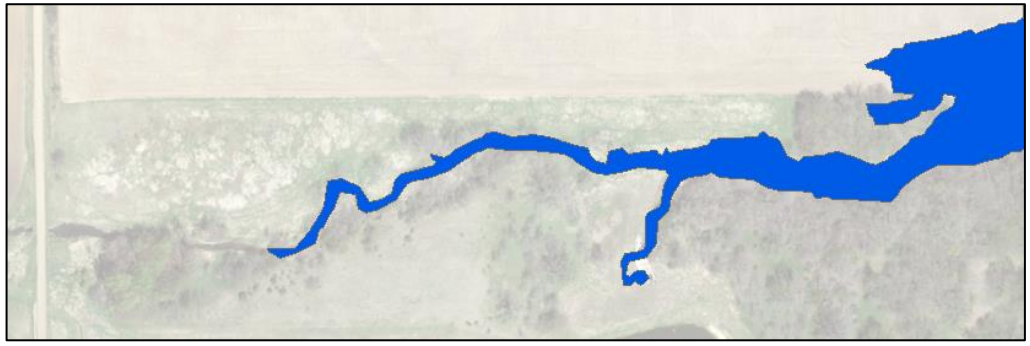
Cleanup Method options



Additions to Floodplains Tool

Cleanup Method options

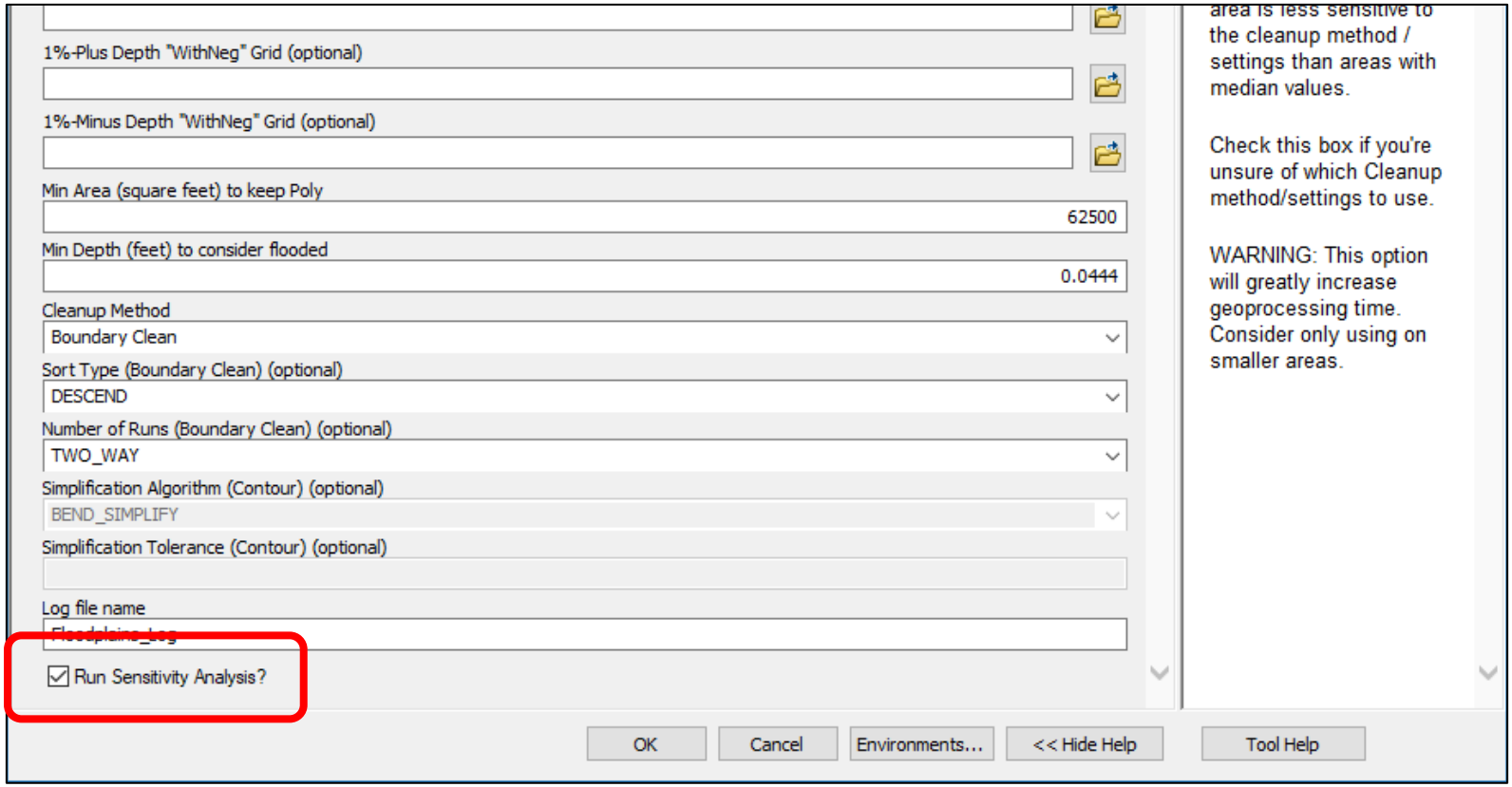
Boundary Clean: Descending, Two-Way



Boundary Clean: Descending, One-Way

Additions to Floodplains Tool

Run Sensitivity Analysis option

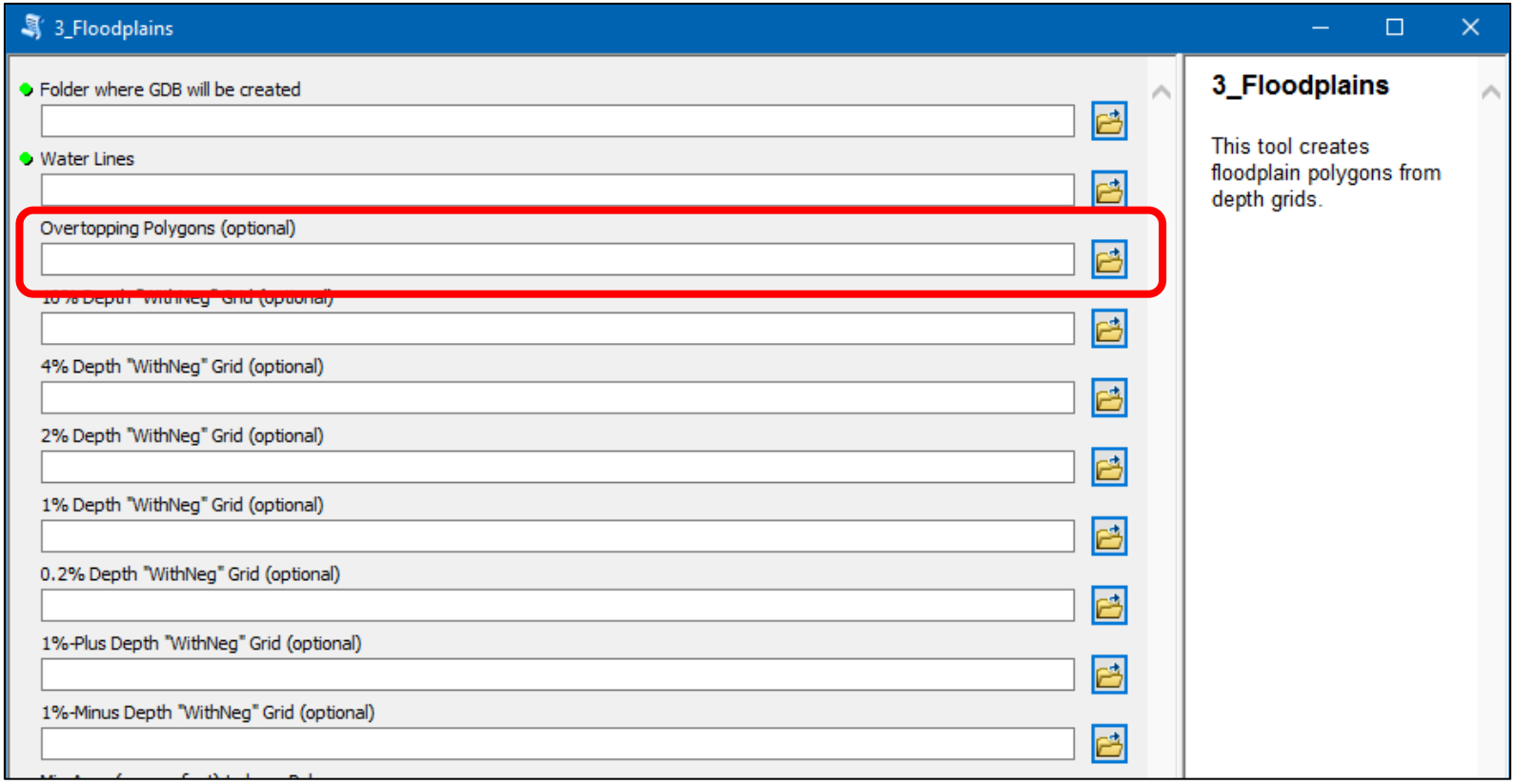


Additions to Floodplains Tool

Run Sensitivity Analysis option

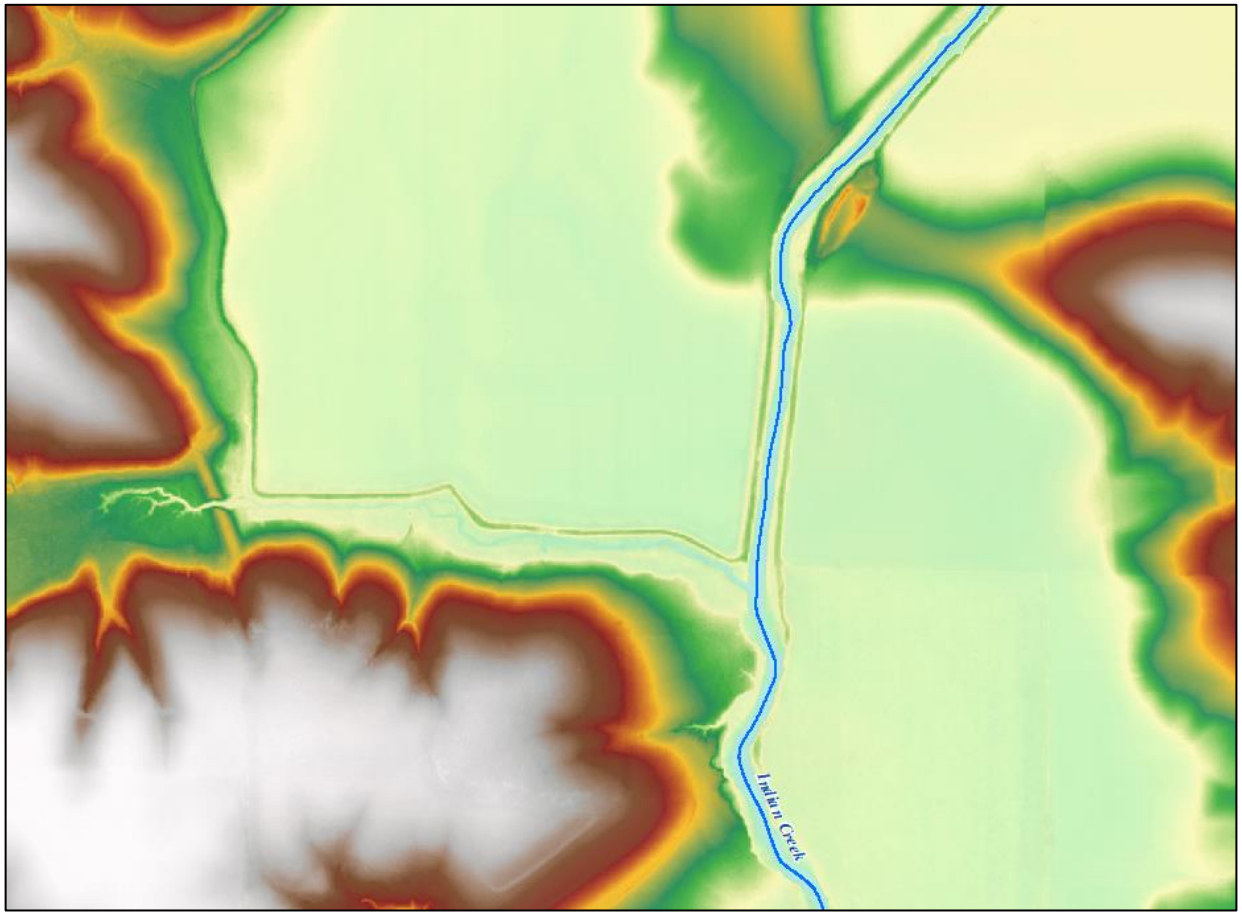
Additions to Floodplains Tool

Overtopping Polygons (New Input)



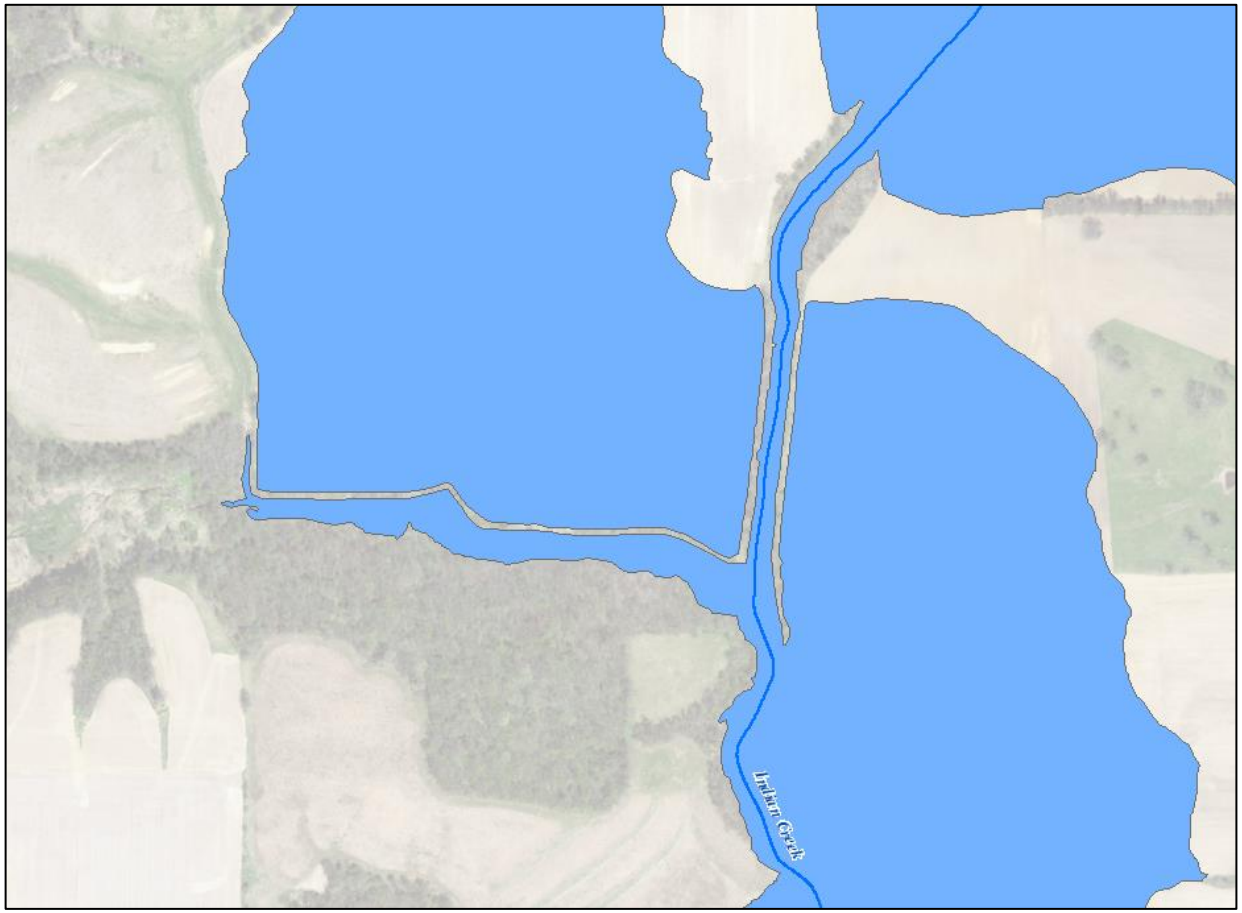
Additions to Floodplains Tool

Overtopping Polygons (New Input)



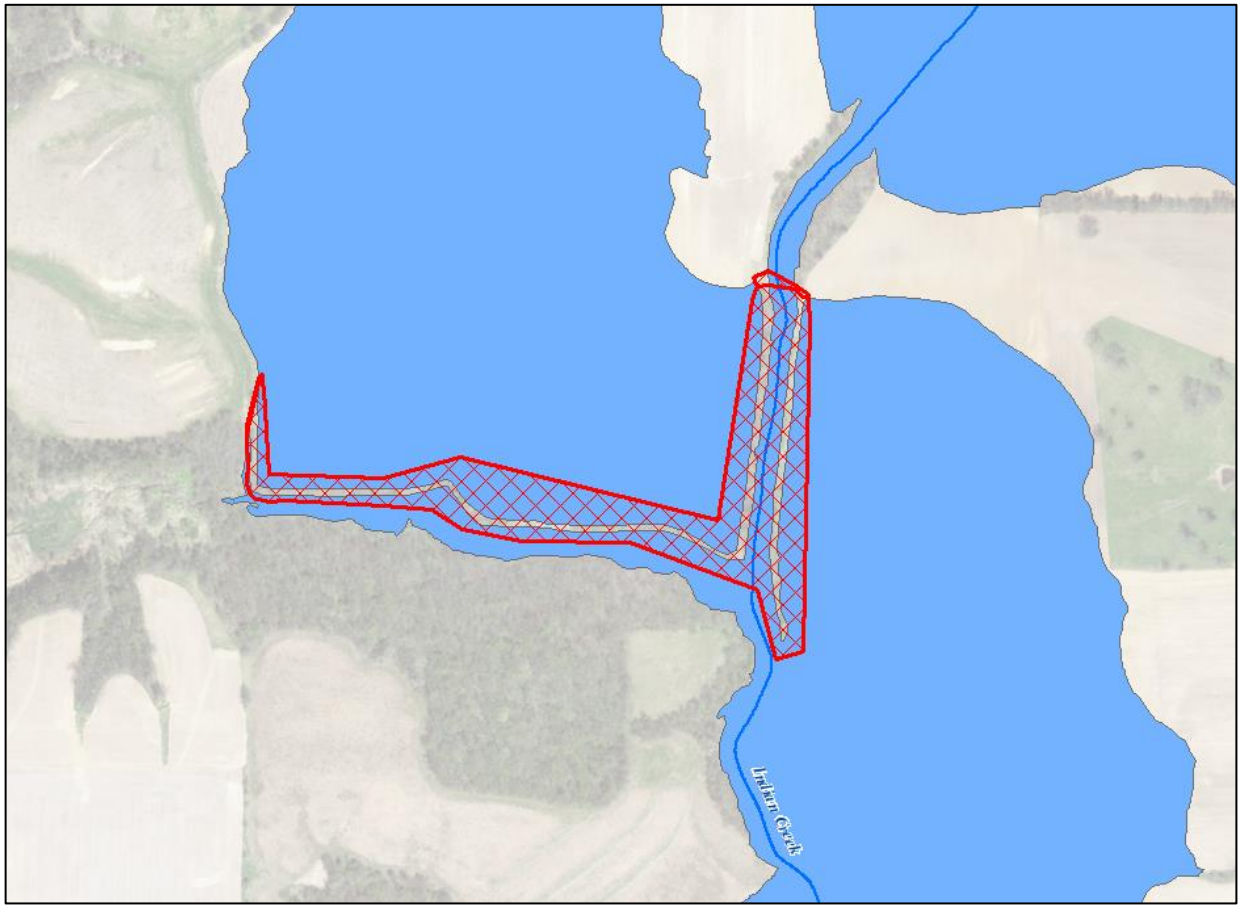
Additions to Floodplains Tool

Overtopping Polygons (New Input)



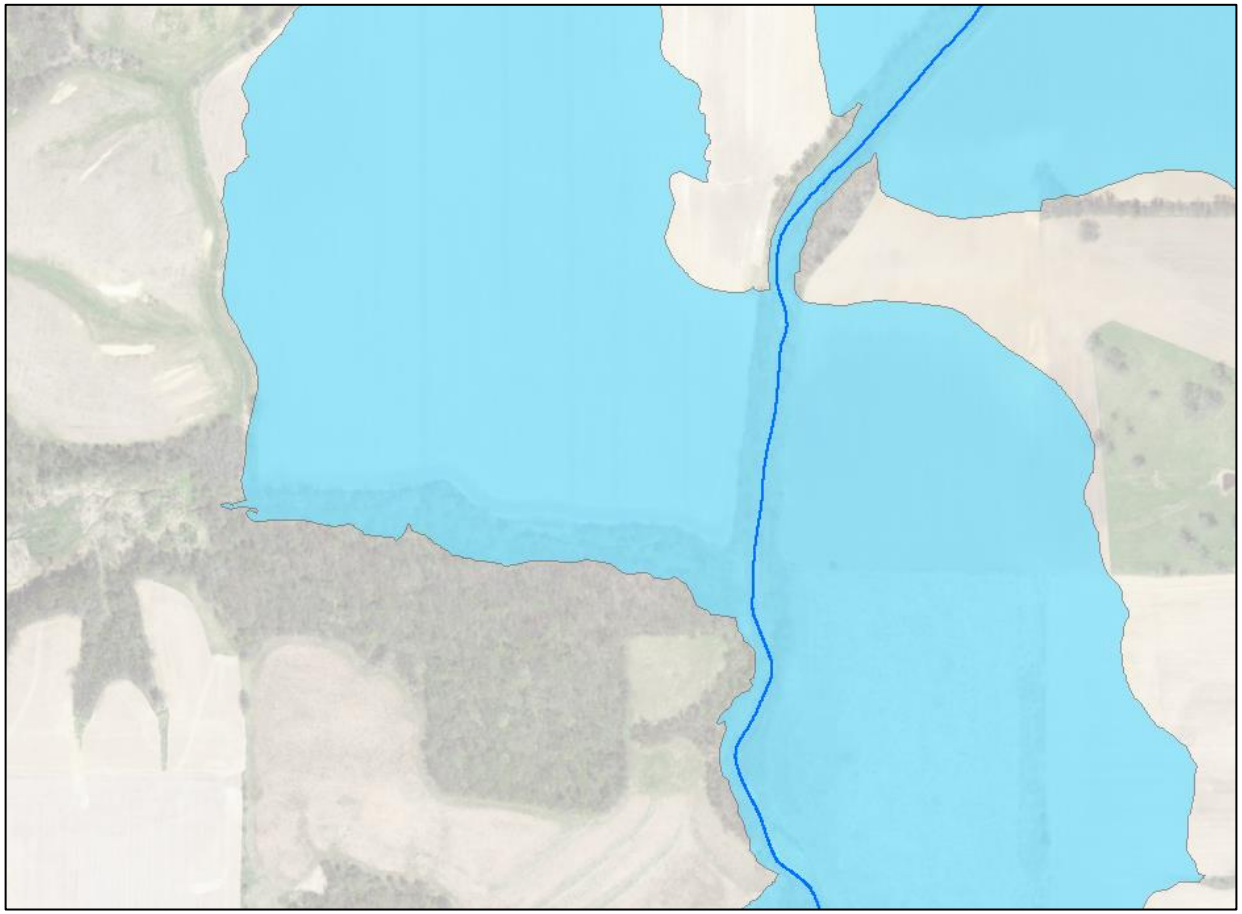
Additions to Floodplains Tool

Overtopping Polygons (New Input)



Additions to Floodplains Tool

Overtopping Polygons (New Input)



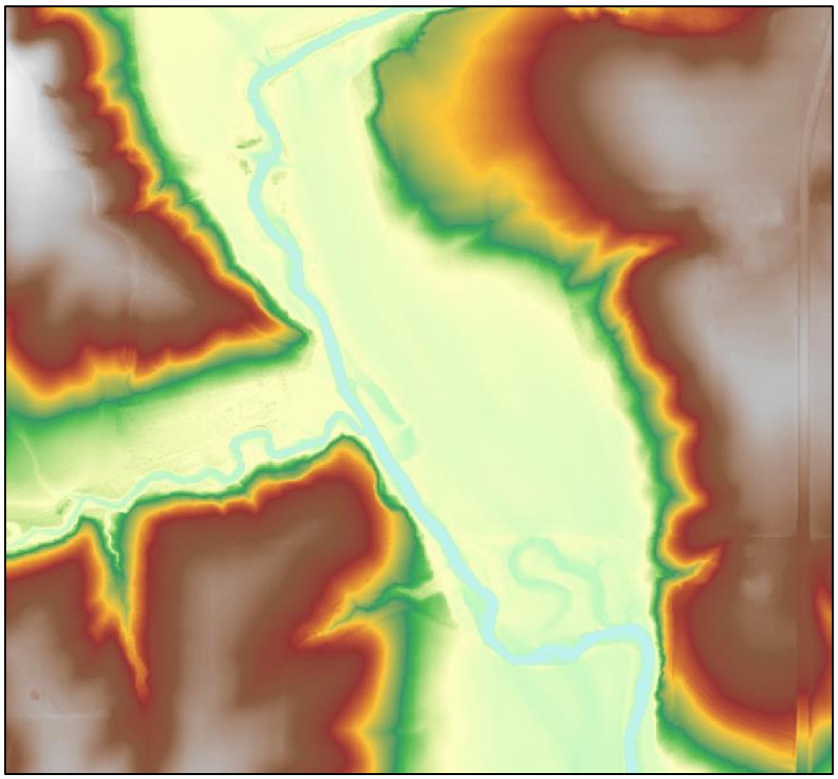
Looking to the Future…

Future Plans (1/3)

Floodplain Tool: Keep all floodplain polygons touching stream lines, regardless of area size

Future Plans (2/3)

2-D Maybe?



Future Plans (3/3)

Migrate to ArcGIS Pro and Python 3 ☺

ArcGIS Pro

Python 3

Questions?

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https://www.illinoisfloodmaps.org