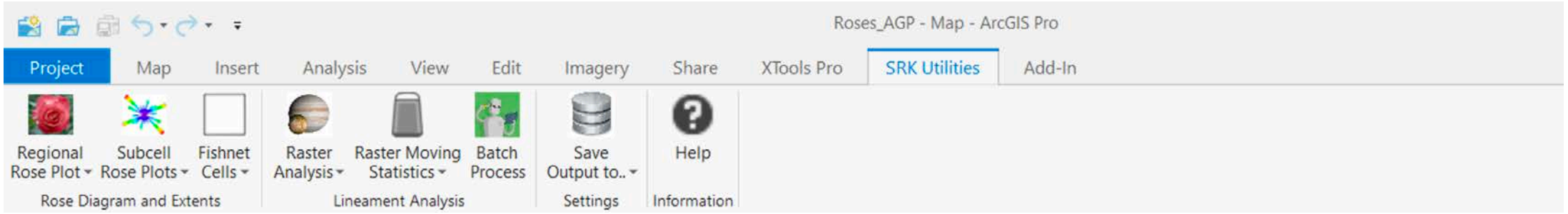

Statistical Lineament Analysis add-in for ArcGIS Pro

By Dr Mike Cunningham, SRK Consulting, Perth, Western Australia

July 8 - 12, 2019 | San Diego Convention Center, San Diego, California

esri srk consulting

Outline of Presentation

- Background
  - Short video
  - About solution
- Rose plots
  - Regional
  - Subcell
- Raster Analysis
  - Lineament analysis statistics
  - Moving window statistics

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Unearthed Explorer Challenge

- Oz Minerals challenge
- Mount Woods Inlier of the Gawler Craton, South Australia
- Identify potential mineralisation targets
- Integrated approach by SRK Consulting

Unearthed Explorer Challenge - background

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Solution

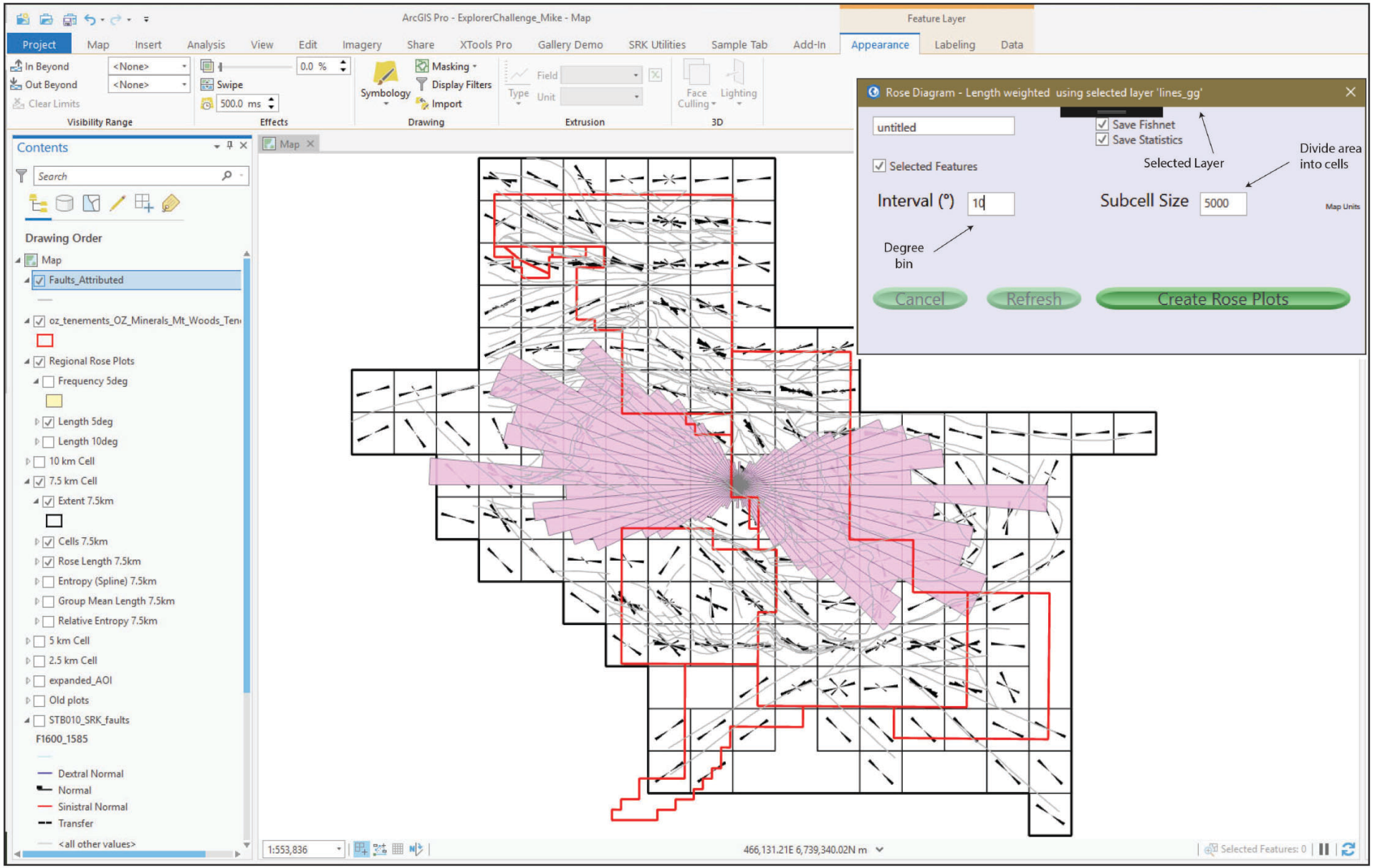
Analyses of 2D lineaments – ArcGIS Pro (add-in)

- Visual Studio (C#)
- Input data => line (and point for rose petal)
- Output => raster, polygon, point, statistics

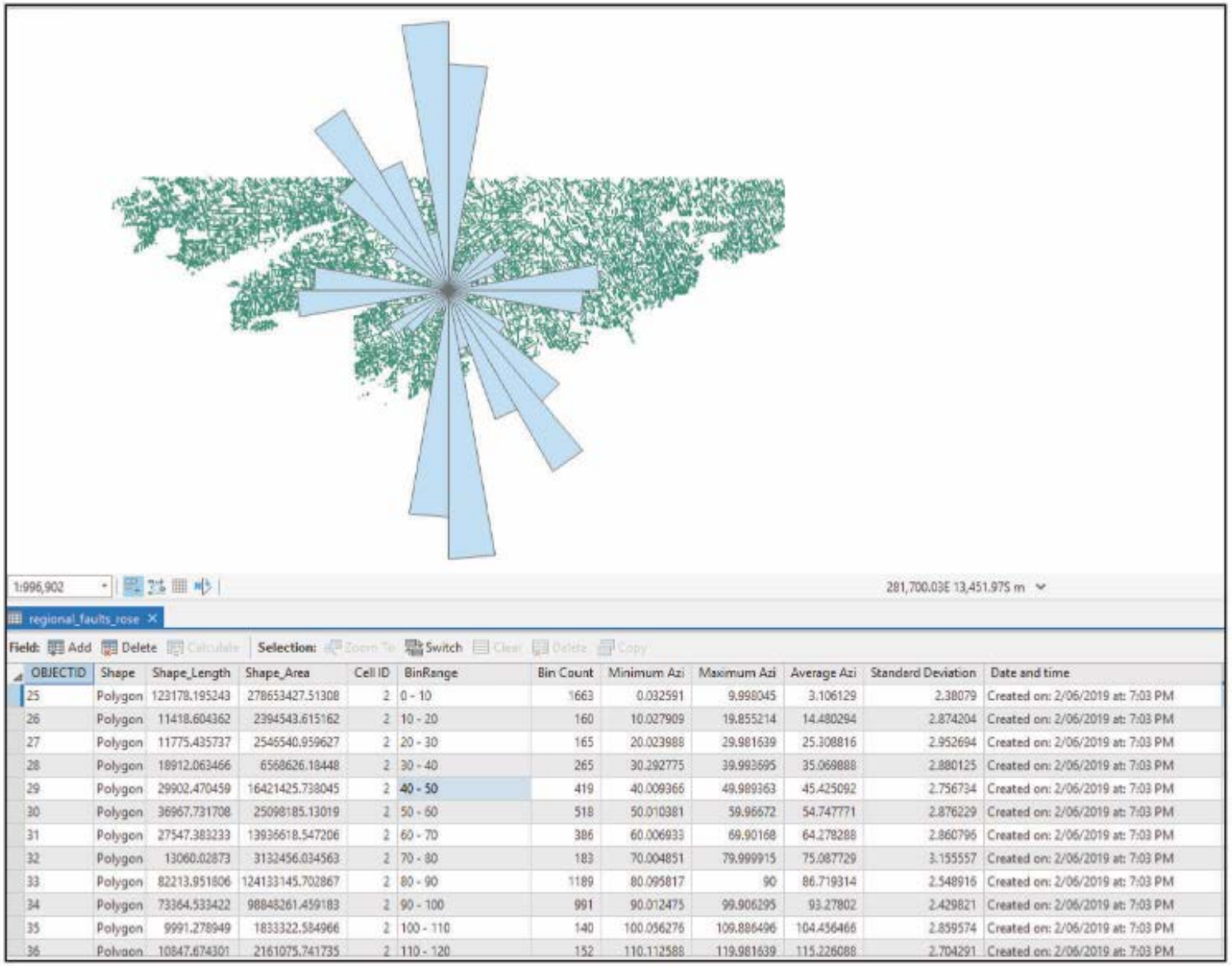
Rose Diagram plots

- Lineaments
  - are narrow zones of subtle tonal change
  - are real features but their geological significance is uncertain

- Rose Diagram plots
  - Relative frequency circular histogram graphs
  - Length weighted


ArcGIS Pro - ExplorerChallenge_Mike - Map
Feature Layer
Project
Map
Insert
Analysis
View
Edit
Imagery
Share
XTools Pro
Gallery Demo
SRK Utilities
Sample Tab
Add-In
Appearance
Labeling
Data
In Beyond
Out Beyond
Clear Limits
Visibility Range
Swipe
Effects
Symbology
Masking
Display Filters
Import
Drawing
Type
Field
Unit
Extrusion
Face Culling
Lighting
3D
Contents
Search
Drawing Order
Map
Faults_Attributed
oz_tenements_OZ_Minerals_Mt_Woods_Ten
Regional Rose Plots
Frequency 5deg
Length 5deg
Length 10deg
10 km Cell
7.5 km Cell
Extent 7.5km
Cells 7.5km
Rose Length 7.5km
Entropy (Spline) 7.5km
Group Mean Length 7.5km
Relative Entropy 7.5km
5 km Cell
2.5 km Cell
expanded_AOI
Old plots
STB010_SRK_faults
F1600_1585
Dextral Normal
Normal
Sinistral Normal
Transfer
<all other values>
Rose Diagram - Length weighted using selected layer 'lines_gg'
untitled
Save Fishnet
Save Statistics
Selected Features
Selected Layer
Divide area into cells
Interval (°)
10
Subcell Size
5000
Map Units
Degree bin
Cancel
Refresh
Create Rose Plots
1:553,836
466,131.21E 6,739,340.02N m
Selected Features: 0

Metadata & statistics per rose cell



1:996,902 281,700.03E 13,451.97S m

regional_faults_rose

Field: Add Delete Calculate Selection: Zoom To Switch Clear Delete Copy

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25	Polygon	123178.195243	278653427.51308	2	0 - 10	1663	0.032591	9.998045	3.106129	2.38079	Created on: 2/06/2019 at: 7:03 PM
26	Polygon	11418.604362	2394543.615162	2	10 - 20	160	10.027909	19.855214	14.480294	2.874204	Created on: 2/06/2019 at: 7:03 PM
27	Polygon	11775.435737	2546540.959627	2	20 - 30	165	20.023988	29.981639	25.308816	2.952694	Created on: 2/06/2019 at: 7:03 PM
28	Polygon	18912.063466	6568626.18448	2	30 - 40	265	30.292775	39.993695	35.069888	2.880125	Created on: 2/06/2019 at: 7:03 PM
29	Polygon	29902.470459	16421425.738045	2	40 - 50	419	40.009366	49.989363	45.425092	2.756734	Created on: 2/06/2019 at: 7:03 PM
30	Polygon	36967.731708	25098185.13019	2	50 - 60	518	50.010381	59.96672	54.747771	2.876229	Created on: 2/06/2019 at: 7:03 PM
31	Polygon	27547.383233	13936618.547206	2	60 - 70	386	60.006933	69.90168	64.278288	2.860796	Created on: 2/06/2019 at: 7:03 PM
32	Polygon	13060.02873	3132456.034563	2	70 - 80	183	70.004851	79.999915	75.087729	3.155557	Created on: 2/06/2019 at: 7:03 PM
33	Polygon	82213.951806	124133145.702867	2	80 - 90	1189	80.095817	90	86.719314	2.548916	Created on: 2/06/2019 at: 7:03 PM
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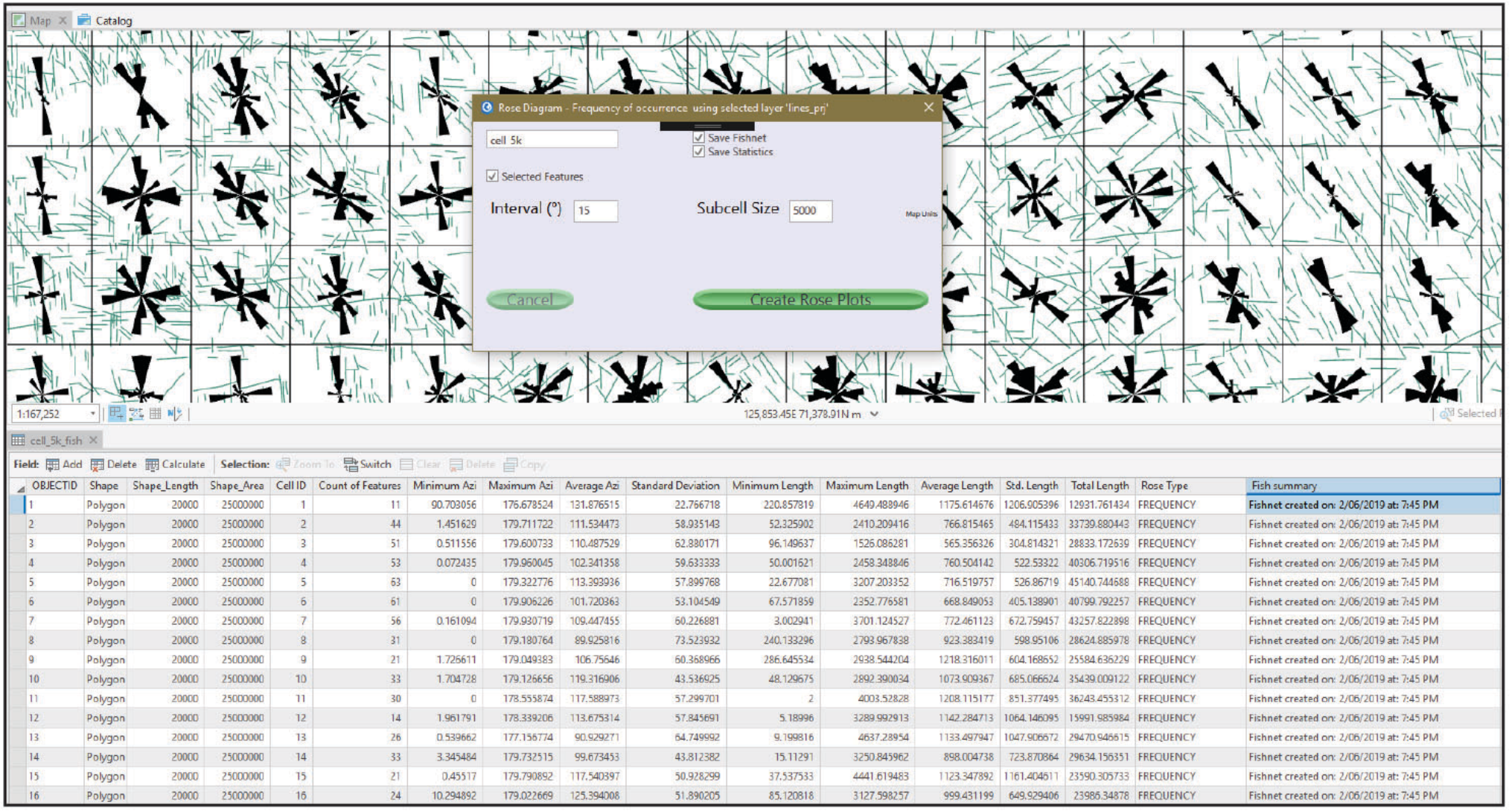
35	Polygon	9991.278949	1833322.584966	2	100 - 110	140	100.056276	109.886496	104.456466	2.859574	Created on: 2/06/2019 at: 7:03 PM
36	Polygon	10847.674301	2161075.741735	2	110 - 120	152	110.112588	119.981639	115.226088	2.704291	Created on: 2/06/2019 at: 7:03 PM



OBJECTID	Shape	Shape_Length	Shape_Area	Cell ID	Count of Features	Minimum Azi	Maximum Azi	Average Azi	Standard Deviation	Minimum Length	Maximum Length	Average Length	Std. Length	Total Length	Rose Type	Fish summary
1	Polygon	20000	25000000	1	11	90.703056	176.678524	131.876515	22.756718	220.857819	4649.488946	1175.614676	1206.905396	12931.761434	FREQUENCY	Fishnet created on: 2/06/2019 at: 7:45 PM
2	Polygon	20000	25000000	2	44	1.451629	179.711722	111.534473	58.935143	52.325902	2410.209416	766.815465	484.115433	33739.880443	FREQUENCY	Fishnet created on: 2/06/2019 at: 7:45 PM
3	Polygon	20000	25000000	3	51	0.511556	179.600733	110.487529	62.880171	96.149637	1526.086281	565.356326	304.814321	28833.172639	FREQUENCY	Fishnet created on: 2/06/2019 at: 7:45 PM
4	Polygon	20000	25000000	4	53	0.072435	179.960045	102.341358	59.633333	50.001621	2458.348846	760.504142	522.53322	40306.719516	FREQUENCY	Fishnet created on: 2/06/2019 at: 7:45 PM
5	Polygon	20000	25000000	5	63	0	179.322776	113.393936	57.899768	22.677081	3207.203352	716.519757	526.86719	45140.744688	FREQUENCY	Fishnet created on: 2/06/2019 at: 7:45 PM
6	Polygon	20000	25000000	6	61	0	179.906226	101.720363	53.104549	67.571859	2352.776581	668.849053	405.138901	40799.792257	FREQUENCY	Fishnet created on: 2/06/2019 at: 7:45 PM
7	Polygon	20000	25000000	7	56	0.161094	179.930719	109.447455	60.226881	3.002941	3701.124527	772.461123	672.759457	43257.822898	FREQUENCY	Fishnet created on: 2/06/2019 at: 7:45 PM
8	Polygon	20000	25000000	8	31	0	179.180764	89.925816	73.523932	240.133296	2793.967838	923.383419	598.95106	28624.885978	FREQUENCY	Fishnet created on: 2/06/2019 at: 7:45 PM
9	Polygon	20000	25000000	9	21	1.726611	179.049383	106.75646	60.368966	286.645534	2938.544204	1218.316011	604.168652	25584.636229	FREQUENCY	Fishnet created on: 2/06/2019 at: 7:45 PM
10	Polygon	20000	25000000	10	33	1.704728	179.126656	119.316906	43.536925	48.129675	2892.390034	1073.909367	685.066624	35439.009122	FREQUENCY	Fishnet created on: 2/06/2019 at: 7:45 PM
11	Polygon	20000	25000000	11	30	0	178.555874	117.588973	57.299701	2	4003.52828	1208.115177	851.377495	36243.455312	FREQUENCY	Fishnet created on: 2/06/2019 at: 7:45 PM
12	Polygon	20000	25000000	12	14	1.961791	178.339206	113.675314	57.845691	5.18996	3289.992913	1142.284713	1064.146095	15991.985984	FREQUENCY	Fishnet created on: 2/06/2019 at: 7:45 PM
13	Polygon	20000	25000000	13	26	0.539662	177.156774	90.929271	64.749992	9.199816	4637.28954	1133.497947	1047.906672	29470.946615	FREQUENCY	Fishnet created on: 2/06/2019 at: 7:45 PM
14	Polygon	20000	25000000	14	33	3.345484	179.732515	99.673453	43.812382	15.11291	3250.845962	898.004738	723.870864	29634.156351	FREQUENCY	Fishnet created on: 2/06/2019 at: 7:45 PM
15	Polygon	20000	25000000	15	21	0.45517	179.790892	117.540397	50.928299	37.537533	4441.619483	1123.347892	1161.404611	23590.305733	FREQUENCY	Fishnet created on: 2/06/2019 at: 7:45 PM
16	Polygon	20000	25000000	16	24	10.294892	179.022669	125.394008	51.890205	85.120818	3127.598257	999.431199	649.929406	23986.34878	FREQUENCY	Fishnet created on: 2/06/2019 at: 7:45 PM

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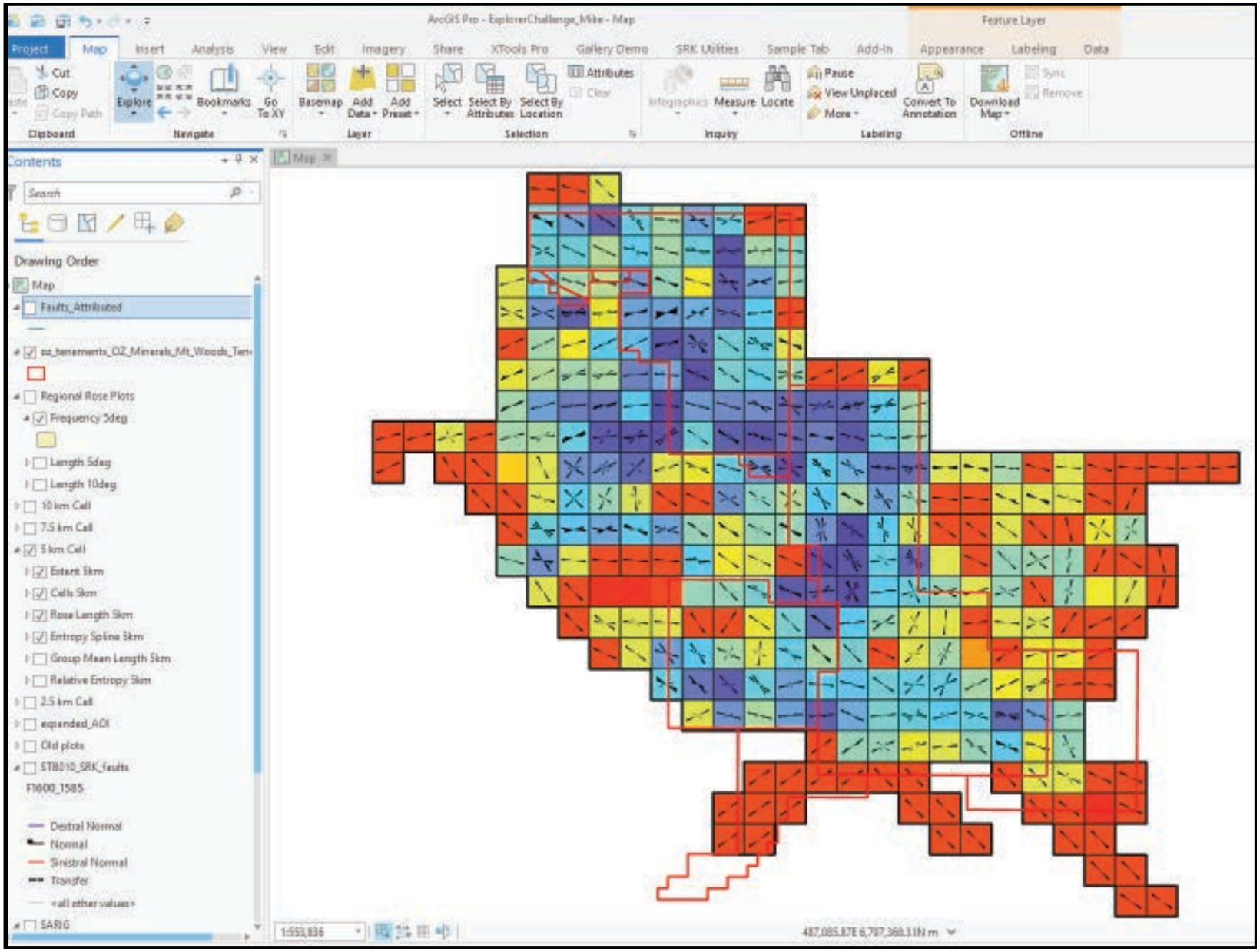
Raster Statistical Grids

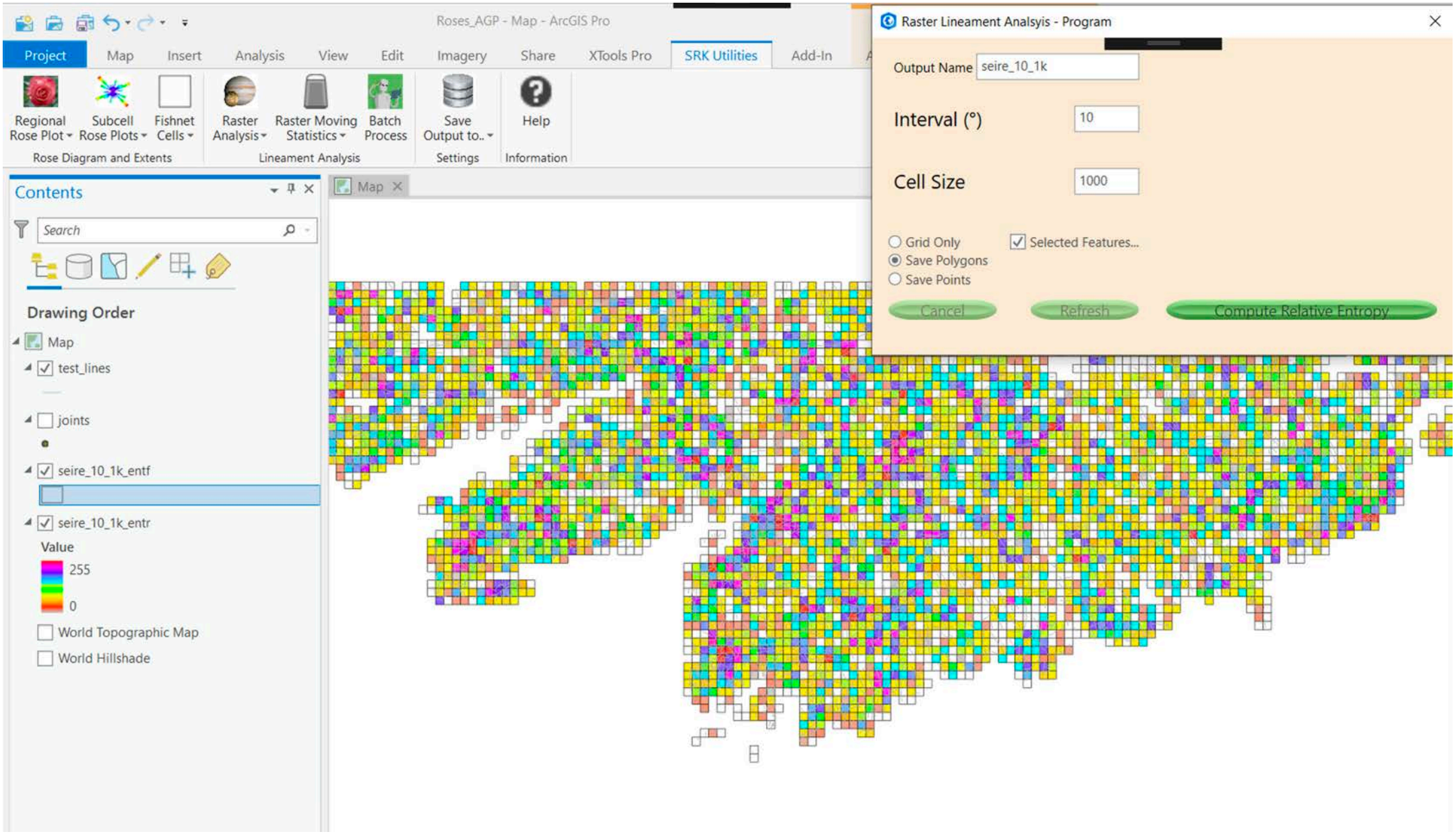
- Methods
  - Relative Entropy
  - Length / Frequency Density
  - Group Mean Length / Frequency
  - Group Dominance Length / Frequency
- Output
  - Grids stretched to 255 value (input for ML / fuzzy logic)
  - Polygon or point with raw values and statistics / metadata

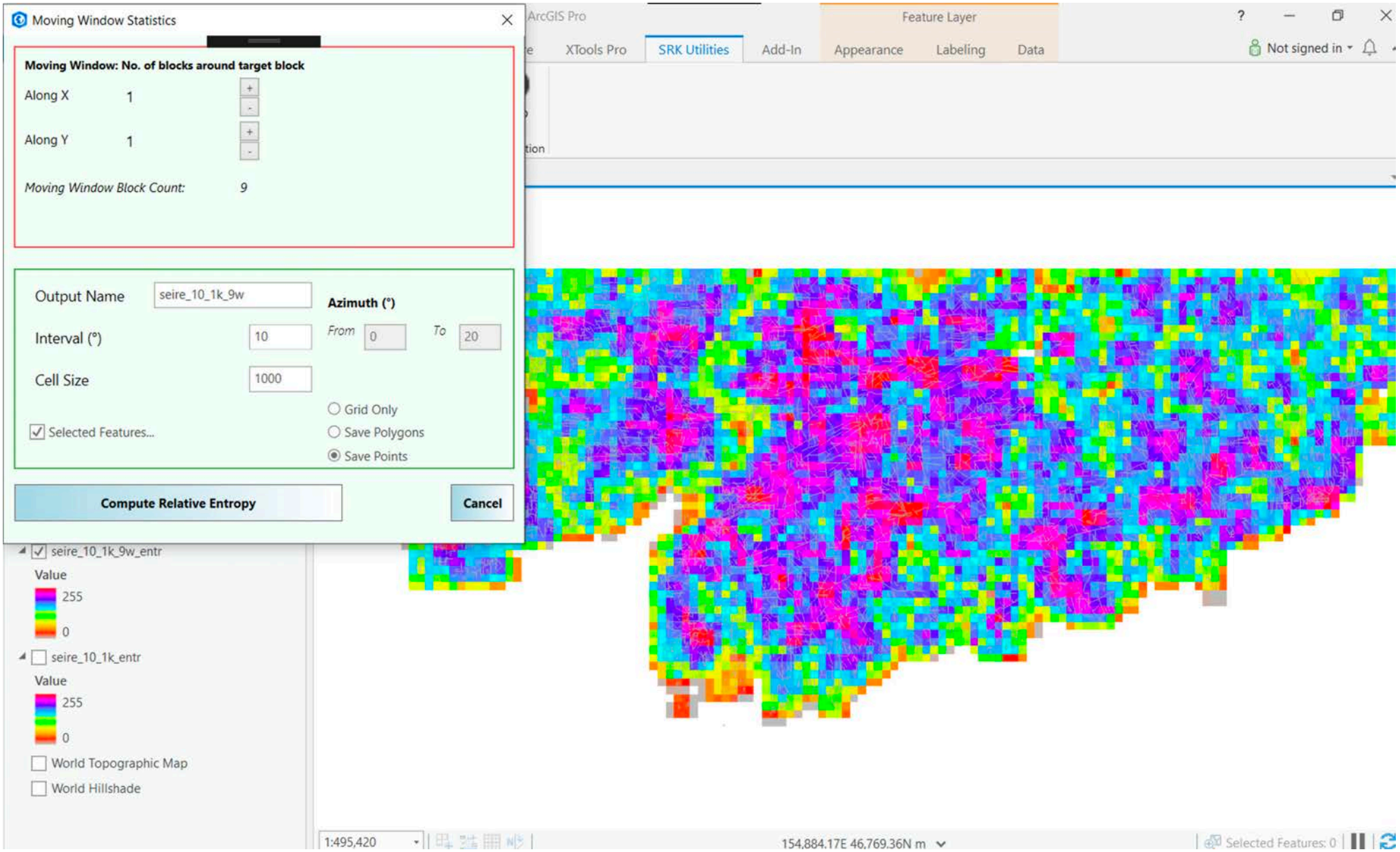
Relative Entropy

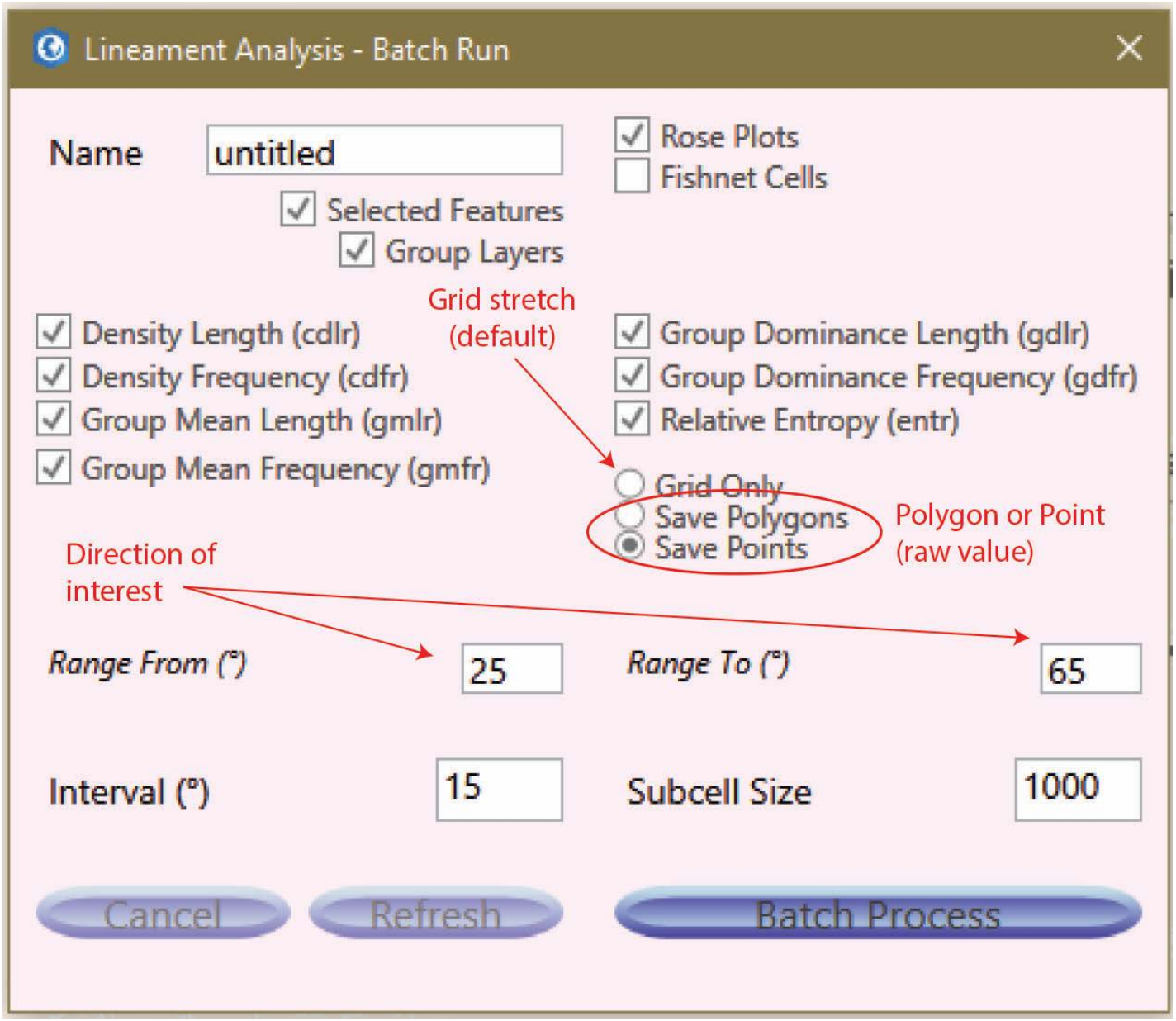
- Relative Entropy is used to measure the degree of randomness of lineaments
- Higher the value greater the degree of randomness
- Need to check if function of observation, i.e. one cell with one line will give very low degree of randomness
  - Length / Frequency density grids for weighting

Relative Entropy 5 km cell




Roses_AGP - Map - ArcGIS Pro
Project
Map
Insert
Analysis
View
Edit
Imagery
Share
XTools Pro
SRK Utilities
Add-In
Regional Rose Plot
Subcell Rose Plots
Fishnet Cells
Rose Diagram and Extents
Raster Analysis
Raster Moving Statistics
Batch Process
Lineament Analysis
Save Output to..
Settings
Help
Information
Contents
Search
Drawing Order
Map
test_lines
joints
seire_10_1k_entf
seire_10_1k_entr
Value
255
0
World Topographic Map
World Hillshade
Map
Raster Lineament Analsyis - Program
Output Name
seire_10_1k
Interval (°)
10
Cell Size
1000
Grid Only
Selected Features...
Save Polygons
Save Points
Cancel
Refresh
Compute Relative Entropy


Moving Window Statistics
Moving Window: No. of blocks around target block
Along X 1
Along Y 1
Moving Window Block Count: 9
Output Name seire_10_1k_9w
Interval (°) 10
Cell Size 1000
Azimuth (°)
From 0
To 20
Grid Only
Save Polygons
Save Points
Selected Features...
Compute Relative Entropy
Cancel
ArcGIS Pro
Feature Layer
XTools Pro
SRK Utilities
Add-In
Appearance
Labeling
Data
Not signed in
seire_10_1k_9w_entr
Value
255
0
seire_10_1k_entr
Value
255
0
World Topographic Map
World Hillshade
1:495,420
154,884.17E 46,769.36N m
Selected Features: 0



Batch Run

Rose Plots
Raster Grids

Polygon or Point for Raw value & metadata

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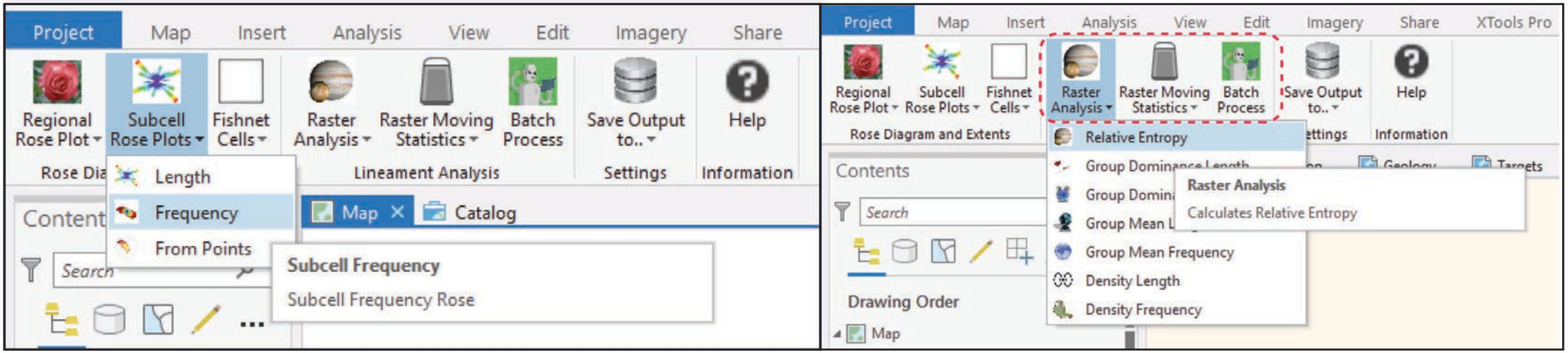

Thank you

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