Correcting a problem associated with Landcover in Exercise 2

The area obtained from land cover cell counts in Exercise 2, can be incorrect (off by about 30%) due to the land cover layer obtained using Extract By Mask, being in the Mercator Auxiliary Sphere Projection. This document will explain how to get this into an Albers Equal Area projection to get correct area values. An important lesson learned here is that the Mercator Auxiliary Sphere Projection is very approximate when it comes to quantitative length and area calculations, and really should only be used for web visualization.

The problem.

In following the procedure in Exercise 2, one obtains 5219911 landcover cells with area 30x30m, which adds up to 4697.92 square kilometers.

This can be seen from the following **Statistics** on the **Count** column in the Landcover layer.

Chart Properties • # ×					
LandCover - Dis	stribution of Count				
Data General G	Guides 🕐				
Variable					
Number					
Count	-				
With transformation	n				
None	•				
Show Normal distribution —					
Bins (i)					
	32 🛟				
Statistics					
✓ Mean	886090.169022230 -				
Median	708249 —				
Std. Dev.	520857.132259069. —				
Count	13910928				
Min	2840				
Max	1623744				
Sum	4625311820271				
Nulls	8691017				
Skewness	0.476213492174663				
Kurtosis	1.766191749589945				

There are n=13910928 cells, of which 8691017 are null. Subtracting and evaluating area I get

n=13910928-8691017=5219911

a=n*30*30/1e6 = 4697.92 km²

The result should be about 3520 km².

General					
Vletadata	Projected Coordinate Syste	WGS 1984 Web Mercator Auxiliary Sphere			
ource	Projection	Mercator Auxiliary Sphere			
Invation	WKID	3857			
Nevation .	Previous WKID 102100 Authority EPSG Linear Unit Meters (1.0)				
Display					
Cache					
oins	False Easting	0.0			
Relates	False Northing	0.0			
	Central Meridian	0.0			
	Standard Parallel 1	0.0			
	Auxiliary Sphere Type	0.0			
	Geographic coordinate sys	tem GCS WGS 1984			
	WKID	4326			

Projection information for this layer shows it is Mercator Auxiliary Sphere

The solution

At the Extract by Mask step specify the output Coordinate System to be North_America_Albers_Equal_Area.

After Setting the inputs and outputs, Click on Environments

Geoprocessing • ‡ ×					
	Extract by Mask				
Parameters Environments					
Input raster					
USA_NLCD_Landscape - 🧎					
Input raster or feature mask data					
Basin 👻 🧀 🦯 🗸					
Output raster					
LandCover_Albers					

Then specify the Output Coordinate System

Geoproces	т † ×	
\odot	≡	
Parameters	Environments	?
Output Coo North_Ame	rdinate System erica_Albers_Equal_Area_Conic	•
Geographic	Transformations	•
Extent	Default	•
Snap Raster		
		-
Cell Size		
Maximum	of Inputs	- 📄
Mask		
		- 🧀

In the layer that results, the coordinate system should be as below

Layer Properties: LandCover_Albers					
General	Projected Coordinate System	North America Albers Equal Area Conic			
Metadata	Projection	Albers			
Source	WKID	102008			
Elevation	Authority	Esri			
Display	Linear Unit	Meters (1.0)			
Cache	False Easting	0.0			
Joins	False Northing	0.0			
Relates	Central Meridian	-96.0			
	Standard Parallel 1	20.0			
	Standard Parallel 2	60.0			
	Latitude Of Origin	40.0			
	Geographic coordinate system	GCS North American 1983			
	WKID	4269			
	Authority	EDC/	ř.		
		<u>O</u> K Cancel			

Open the attribute table and you see that the cell counts are different.

New

III LandCoverAlbers ×								
Field: 📰 Add 🐺 Delete 🕎 Calculate Selection: 🍕 Zoom To 📲 Switch 📃 Cl								
⊿	OBJECTID	Value	Count	Land Cover	Red	Green	Blue	
	1	11	17291	Open Water	84	117	168	
	3	21	298040	Developed Open Spa	232	209	209	
	4	22	43192	Developed Low Inten	226	158	140	
	5	23	22807	Developed Medium I	255	0	0	
	6	24	9685	Developed High Inte	181	0	0	
	7	31	9081	Barren Land	210	205	192	
	0	44	420002	D 11 E 1	100	100	100	

Old

III LandCover_Albers III LandCover ×									
Fi	Field: 📰 Add 🕎 Delete 🕎 Calculate Selection: 🚭 Zoom To 📲 Switch 📄 Clear 💭 Delete 🗐 Copy								
4	OBJECTID	Value	Count	Land Cover	Red	Green	Blue	MainClass	
	1	11	22953	Open Water	84	117	168	Water	
	3	21	397560	Developed Open Spa	232	209	209	Developed	
	4	22	57698	Developed Low Inten	226	158	140	<null></null>	
	5	23	30303	Developed Medium I	255	0	0	<null></null>	
	6	24	12759	Developed High Inte	181	0	0	<null></null>	

Calculating statistics on the Count column results in:

Chart Properties • 4 ×				
LandCoverAlbers	- Distribution of C			
Data General G	uides 🕜			
Variable				
Number				
Count	*			
With transformation	n			
None	•			
Show Normal distribution —				
Bins 🛈 📃				
32				
Statistics				
✓ Mean	663377.336347230			
Median	531747 —			
Std. Dev.	389737.343796022 —			
Count	10931796			
Min	2167			
Max	1215578			
Sum	2594464782190			
Nulls	7020802			
Skewness	0.476320422818513			
Kurtosis	1.76829995865665.			

There are n=10931976 cells, of which 7020802 are null. Subtracting and evaluating area I get n=10931976 -7020802 = 3911174 a= n*30*30/1e6= 3520.057 km² This is now a more precise area estimate.

To get more precise area values the projected "LandCoverAlbers" layer and table should be used in the calculations on pages 26-30 of the exercise.