

Segment Change Analysis Tool

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Script: segment_change_analysis.py

Batch Script: batch_segment_segment_change_analysis.py

https://github.com/danzelenak-usgs/lcmap_eval_products/tree/master/Segment_Change_Analysis

Usage: segment_change_analysis.py [-h] -i INDIR -o OUTDIR [-y [YEARS [YEARS ...]]]

For use on a single tile; the mapped PyCCD products for a tile must be in the same directory.

Optional arguments:

-h, --help show this help message and exit

-i INDIR, --indir INDIR

Full path to the directory containing From-To layers

-o OUTDIR, --output OUTDIR

Full path to the output folder

-y [YEARS [YEARS ...]], --years [YEARS [YEARS ...]]

Optionally specify a from-to year or years. Otherwise
process all available years

Usage: batch_segment_change_analysis.py [-h] -i ROOTDIR -o OUTDIR [-t TILE]

[-y [YEARS [YEARS ...]]]

For use on a root directory containing tile subfolders. Each subfolder contains the mapped PyCCD results for that given tile.

Optional arguments:

-h, --help show this help message and exit

-i ROOTDIR The full path to the root directory

-o OUTDIR The full path to the output root directory

-t TILE Optionally specify a tile to process

-y [YEARS [YEARS ...]]

Optionally specify one or more years to process

Outputs

Using Tile H28v09 as an example:

H28V09_segment_analysis.xlsx

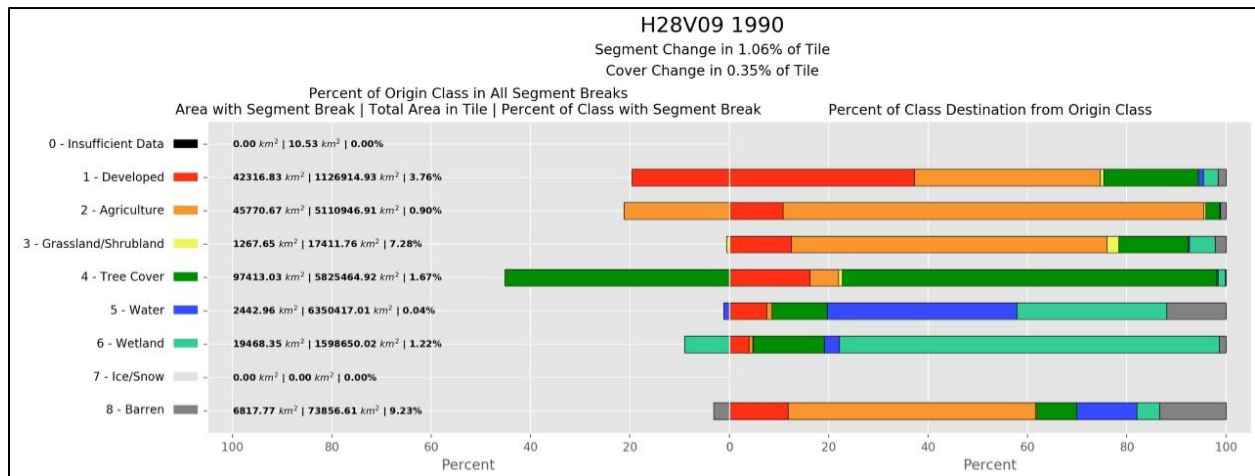
An excel workbook containing multiple worksheets. One sheet per year along with a summary worksheet for all years.

Complete Summary

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P				
1			Segment Change Originating Class Count																	
2			1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997				
3		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
4		1	36374	273797	258515	84559	37621	15167	4475	10858	4100	6455	23710	18695	1393	3217				
5		2	10041	90852	103247	91179	39404	52810	18050	62728	29933	52543	26627	40763	17982	31512				
6		3	415910	1523191	2681625	1754747	1256002	1014168	474105	2017453	392333	1026842	897848	735982	299910	483721				
7		4	61887	45758	153911	38395	69259	37780	29302	34455	38109	32897	36699	53319	32081	24954				
8		5	1078127	282547	45401	37980	24189	14639	7276	20511	27640	50532	31334	32849	11786	13560				
9		6	7159	8737	3693	4492	1078	591	176	1200	886	639	821	415	771	1219				
10		7	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
11		8	7903	6140	5939	3720	736	685	283	1030	892	769	891	1053	494	1236				
12		Total	1617401	2231022	3252331	2015072	1428289	1135840	533667	2148235	493893	1206677	1017930	883076	364417	559419				
13			Segment Change Destination Class Count																	
14			1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997				
15		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
16		1	138349	45579	32310	14290	4573	6149	2190	15549	9348	22462	1376	1425	5091	9255				
17		2	83661	194098	212627	144172	63216	79424	24731	44014	33329	44685	39773	46715	17692	27393				
18		3	1359140	1892335	2774188	1791766	1277478	985534	464046	1968561	386633	1056959	931297	772510	300126	477857				
19		4	28949	48686	195054	35526	56836	38459	23841	38321	35694	34072	25403	41376	31585	24026				
20		5	3219	36208	23772	17553	22135	18720	16204	73151	22456	42518	14507	16323	7610	17448				
21		6	2231	9465	7629	5608	2904	5754	2086	5721	2741	3647	2891	2893	1080	1558				
22		7	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
23		8	1852	4651	6751	6157	1147	1800	569	2918	3692	2334	2683	1834	1233	1882				
24		Total	1617401	2231022	3252331	2015072	1428289	1135840	533667	2148235	493893	1206677	1017930	883076	364417	559419				
25			Segment Change Originating Class Percent																	
26			1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997				
27		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
28		1	2.24892	12.2723	7.94861	4.19633	2.63399	1.33531	0.83854	0.50544	0.83014	0.53494	2.32924	2.11703	0.38225	0.57506				
29		2	0.62081	4.07221	3.17455	4.52485	2.75883	4.64942	3.38226	2.91998	6.06062	4.35435	2.6158	4.61602	4.93446	5.63299				
30		3	25.7147	68.2732	82.4524	87.0811	87.9375	89.2879	88.8391	93.9121	79.4368	88.0801	88.2033	83.343	82.2986	86.4685				
31		4	3.82632	2.05099	4.73233	1.90539	4.84909	3.32617	5.49069	1.60387	7.71604	2.72625	3.60526	6.03787	8.80338	4.4607				
32		5	66.658	12.6645	1.39595	1.8848	1.69356	1.28883	1.3634	0.95478	5.59635	4.1877	3.07821	3.71984	3.23421	2.42394				
33		6	0.44262	0.39161	0.11355	0.22292	0.07547	0.05203	0.03298	0.05586	0.17939	0.05296	0.08065	0.04699	0.21157	0.2179				
34		7	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
35		8	0.48862	0.27521	0.18261	0.18461	0.05153	0.06031	0.05303	0.04795	0.18061	0.06373	0.08753	0.11924	0.13556	0.22094				
36			Segment Change Destination Class Percent																	
37			1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997				
38		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
39		1	2.24892	12.2723	7.94861	4.19633	2.63399	1.33531	0.83854	0.50544	0.83014	0.53494	2.32924	2.11703	0.38225	0.57506				
40		2	0.62081	4.07221	3.17455	4.52485	2.75883	4.64942	3.38226	2.91998	6.06062	4.35435	2.6158	4.61602	4.93446	5.63299				
41		3	25.7147	68.2732	82.4524	87.0811	87.9375	89.2879	88.8391	93.9121	79.4368	88.0801	88.2033	83.343	82.2986	86.4685				
42		4	3.82632	2.05099	4.73233	1.90539	4.84909	3.32617	5.49069	1.60387	7.71604	2.72625	3.60526	6.03787	8.80338	4.4607				
43		5	66.658	12.6645	1.39595	1.8848	1.69356	1.28883	1.3634	0.95478	5.59635	4.1877	3.07821	3.71984	3.23421	2.42394				
44		6	0.44262	0.39161	0.11355	0.22292	0.07547	0.05203	0.03298	0.05586	0.17939	0.05296	0.08065	0.04699	0.21157	0.2179				
45		7	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
46		8	0.48862	0.27521	0.18261	0.18461	0.05153	0.06031	0.05303	0.04795	0.18061	0.06373	0.08753	0.11924	0.13556	0.22094				
47			Segment Change Destination Class Percent																	
48			1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997				
49		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
50		1	8.55378	2.04297	0.99344	0.70916	0.32017	0.54136	0.41037	0.7238	1.89272	1.86148	0.13518	0.16137	1.39703	1.6544				
51		2	5.17256	8.69996	6.53768	7.15468	4.426	6.99253	4.63416	2.04884	6.74822	3.70315	3.90724	5.29003	4.85488	4.89669				
52		3	84.0323	84.8192	85.2985	88.9182	89.4411	86.767	86.9542	91.6362	78.2827	87.5925	91.4893	87.4794	82.3578	85.4202				
53		4	1.78985	2.18223	5.99736	1.76301	3.97931	3.38595	4.46739	1.78384	7.22707	2.82362	2.49555	4.68544	8.66727	4.29481				
54		5	0.19902	1.62293	0.73092	0.87109	1.54976	1.64812	3.03635	3.40517	4.54673	3.52356	1.42515	1.84843	2.08827	3.11895				
55		6	0.13794	0.42425	0.23457	0.2783	0.20332	0.50659	0.39088	0.26631	0.55498	0.30223	0.28401	0.3276	0.29636	0.2785				
56		7	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
57		8	0.1145	0.20847	0.20757	0.30555	0.08031	0.15847	0.10662	0.13583	0.74753	0.19342	0.26357	0.20768	0.33835	0.33642				
58			Segment Break Class From-To Distribution																	
59			Destination																	
60			0	1	2	3	4	5	6	7	8	Total								
61		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
62		1	1391253	1126915	5.57															
63		2	6309811	5110947	25.24															
64		3	21496	17411.76	0.09															
65		4	7191932	5825465	28.77															
66		5	7840021	6350417	31.36															
67		6	1973642	1598650	7.89															
68		7	0	0	0															
69		8	91181	73856.61	0.36															
70		Total	0	47452	79693	1559	106904	3750	23093	0	3595	266046								
71			Total Class Distribution																	
72			Count	Area	% Tile															
73		0	13	10.53	0															
74		1	42316.83	1126915	3.76															
75		2	45770.67	5110947	0.9															
76		3	1267.65	17411.76	7.28															
77		4	97413.03	5825465	1.67															
78		5	2442.96	6350417	0.04															
79		6	19468.35	1598650	1.22															
80		7	0	0	0															
81		8	91181	73856.61	0.36															
82		Total	0	47452	79693	1559	106904	3750	23093	0	3595	266046								
83			Segment Break Class Summary																	
84			Seg Area	Total Area	% Class	% Breaks														
85		0	0	10.53	0	0														
86		1	42316.83	1126915	3.76	19.64														
87		2	45770.67	5110947	0.9	21.24														
88		3	1267.65	17411.76	7.28	0.59														
89		4	97413.03	5825465	1.67	45.2														
90		5	2442.96	6350417	0.04	1.13														
91		6	19468.35	1598650	1.22	9.03														
92		7	0	0	0	0														
93		8	91181	73856.61	0.36	1.13														
94		Total	0	47452	79693	1559	106904	3750	23093	0	3595	266046								

h28v09_SegChange_1990_fig.png

The image contains a graph (left) that shows the percent of the tile's overall segment change for each class at a particular year. An adjacent graph (right) shows the percentage of class distribution from the originating class. The numbers given on the left graph indicate the area of the class with a segment change and the percent of total segment change in the tile for that class. These are produced for each year in the time series, or optionally each year specified at the command line.



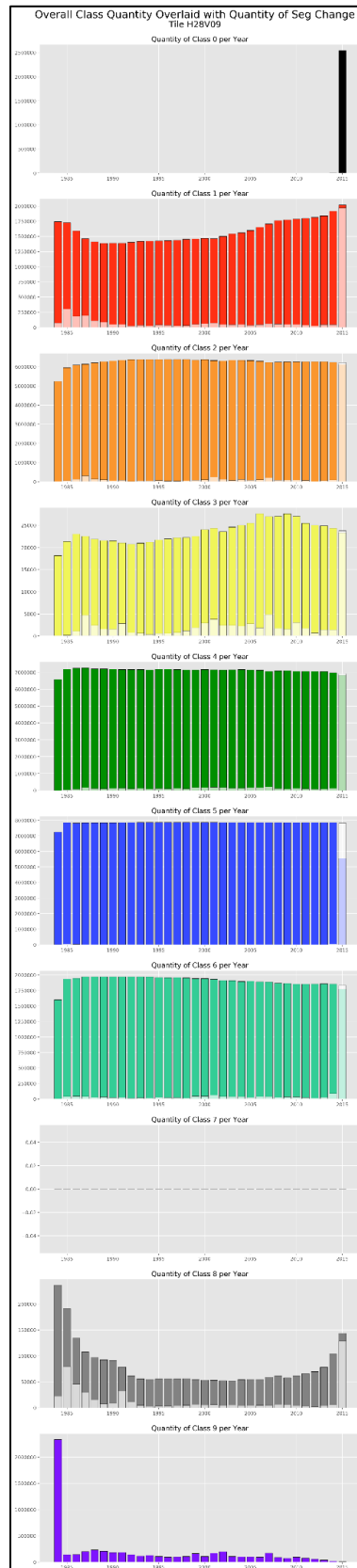
H28V09_summary.png

This image contains graphs showing the origin and destination class quantities and percentages through time. One image is produced for the entire time series per tile.



H28V09_class_totals.png

This image contains graphs depicting the class distribution through time. The semi-transparent bars that are overlaid onto the graphs represent the quantity per year of segment change for each class. One image is produced for the entire time series per tile.



>100% in 2015 Segment Change Analysis Explained

This example comes from tile H28V09, but the following has been observed in all other tiles I've looked at so far.

I noticed the 2015 annual segment change analysis total segment count for some classes is greater than the total count for those same classes. I figured something was wrong because I was getting percentages of classes that had segment changes that were greater than 100%. I went back to the source raster data: SegmentChange_2015.tif and CoverPrim_2015.tif. The pixel counts were identical to what I was reporting in the figures. So, I was curious to see what segment changes were accounting for these extra class pixels that weren't showing up in the CoverPrim map.

I used class 3 grassland/shrubland as an example. I found that there were instances of segment change in which class 3 changed to a different class in the segment change map (SegmentChange_2015.tif), but those same pixels were sometimes being classified as the origin class 3, and sometimes as the destination class in the primary cover map (CoverPrim_2015.tif).

Class percentages for all years are probably a little off though because I'm not taking the time of the segment break into account. I believe that this issue is more noticeable for 2015 because virtually every pixel has a segment break towards the end of 2015 (i.e. after July 1st).

I would say this is a non-issue because the primary cover value depends on the segment that intersects July 1 of that year. However, this illustrates some of the implications with trying to compare the land cover product with the segment change so I thought it was still worth documenting.

This also explains why on the class totals graphs that in 2015 there are instances where the quantity of segment change is greater than the quantity of the class itself (the semi-transparent bar is higher than the underlying class-total bar).

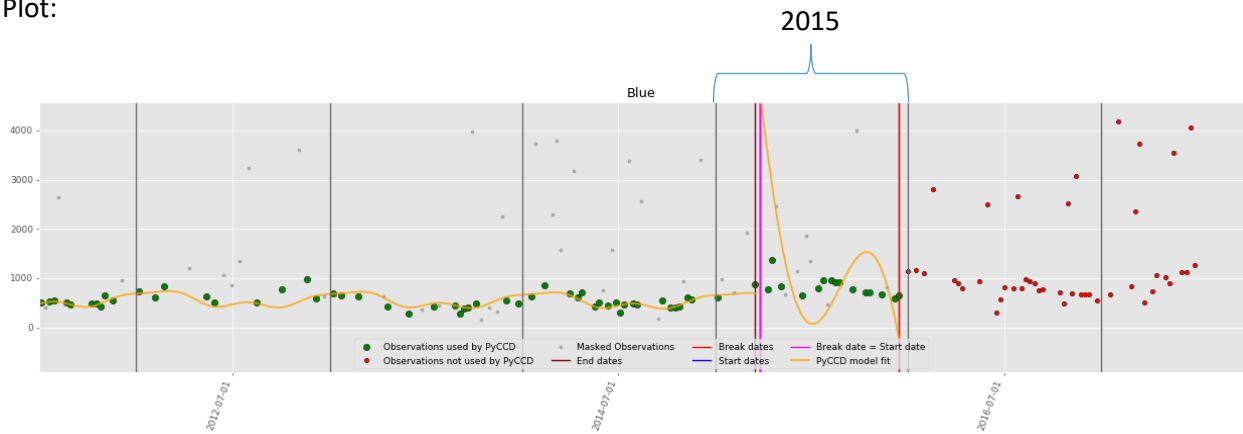
Scenario 1:

SegmentChange = 38

CoverPrim = 8

Pixel Coords = 1635269.631 1902242.066 meters

Plot:



Mid 2015 End Date = 3/18/2015

Mid 2015 Break Date = 3/26/2015

The break occurs before July 1, so the 2015 primary cover value is assigned the destination class 8.

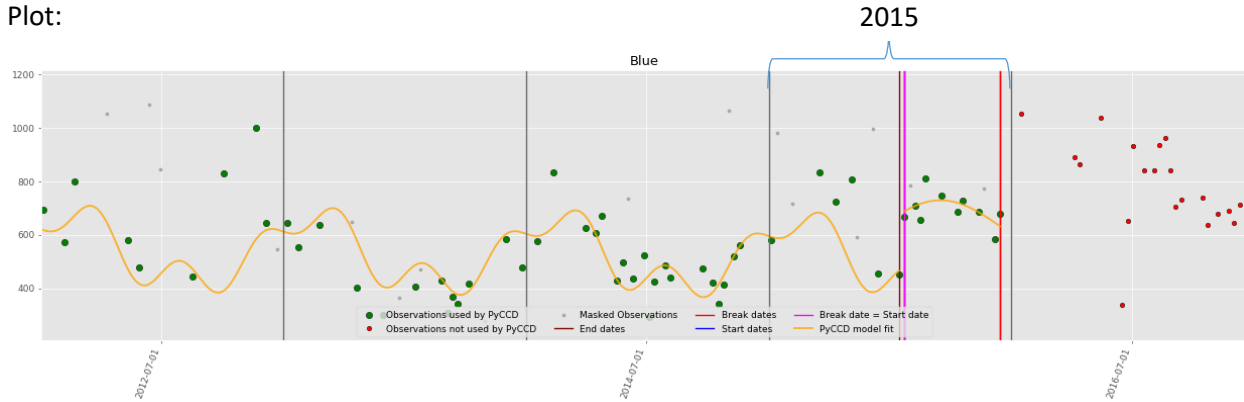
Scenario 2:

SegmentChange = 31

CoverPrim = 3

Pixel Coords = 1635301.440 1902273.875 Meters

Plot:



Mid 2015 End Date = 7/16/2015

Mid 2015 Break Date = 7/24/2015

So the break date happens after 7/1 and the 2015 primary cover value is assigned the origin class 3.