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Supplementary Materials for

Land Cover and Land Use Change in the US Prairie Pothole Region Using the USDA Cropland Data Layer

by Woubet G. Alemu, Geoffrey M. Henebry, and Assefa M. Melesse

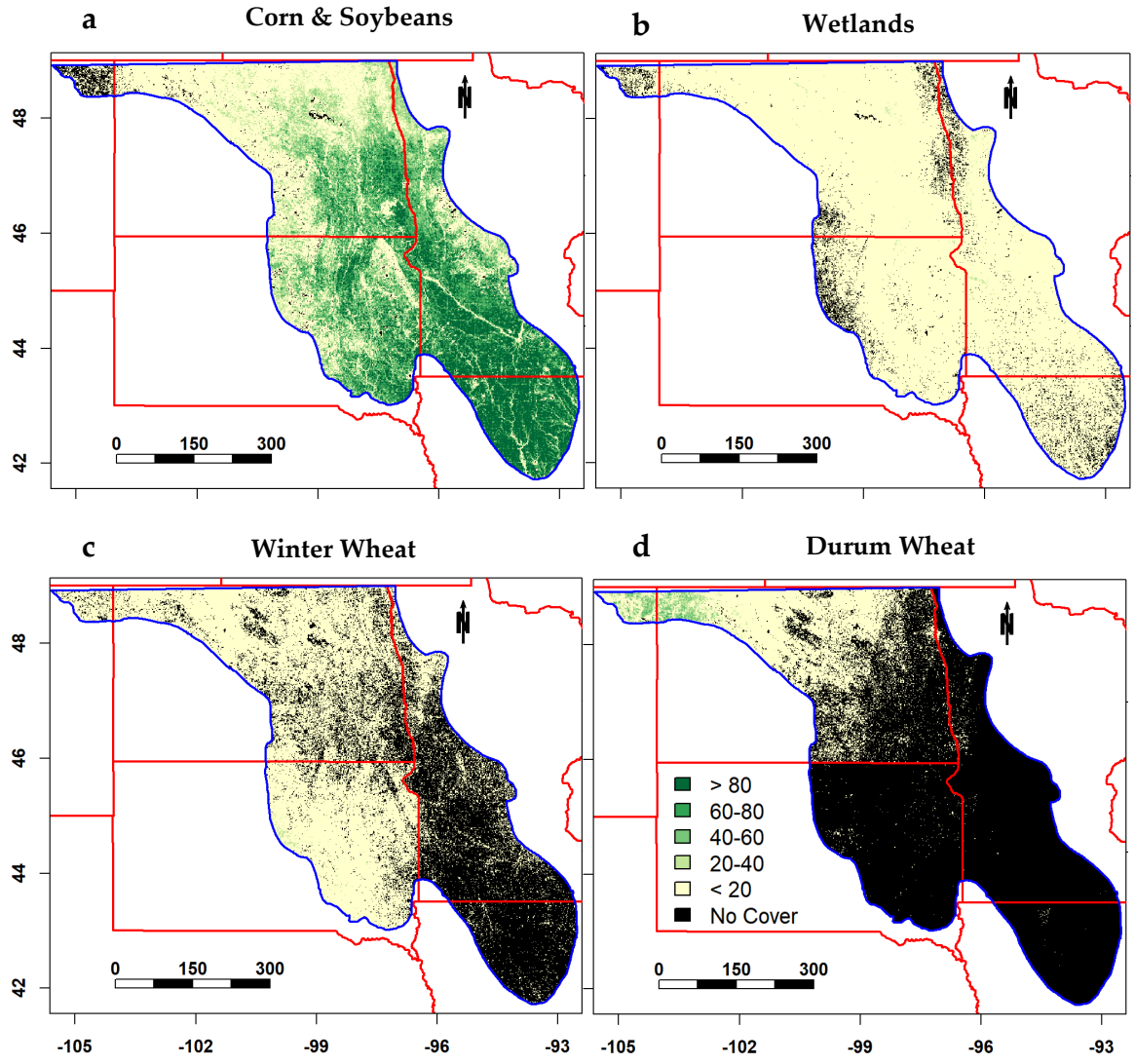

Figure S1. Mean land cover percentages from the USDA NASS CDL using 510 m resolution aggregated pixel for the US portion of the Prairie Pothole Region (PPR) between 2006 and 2018. PPR boundary appears in blue and state borders in red.

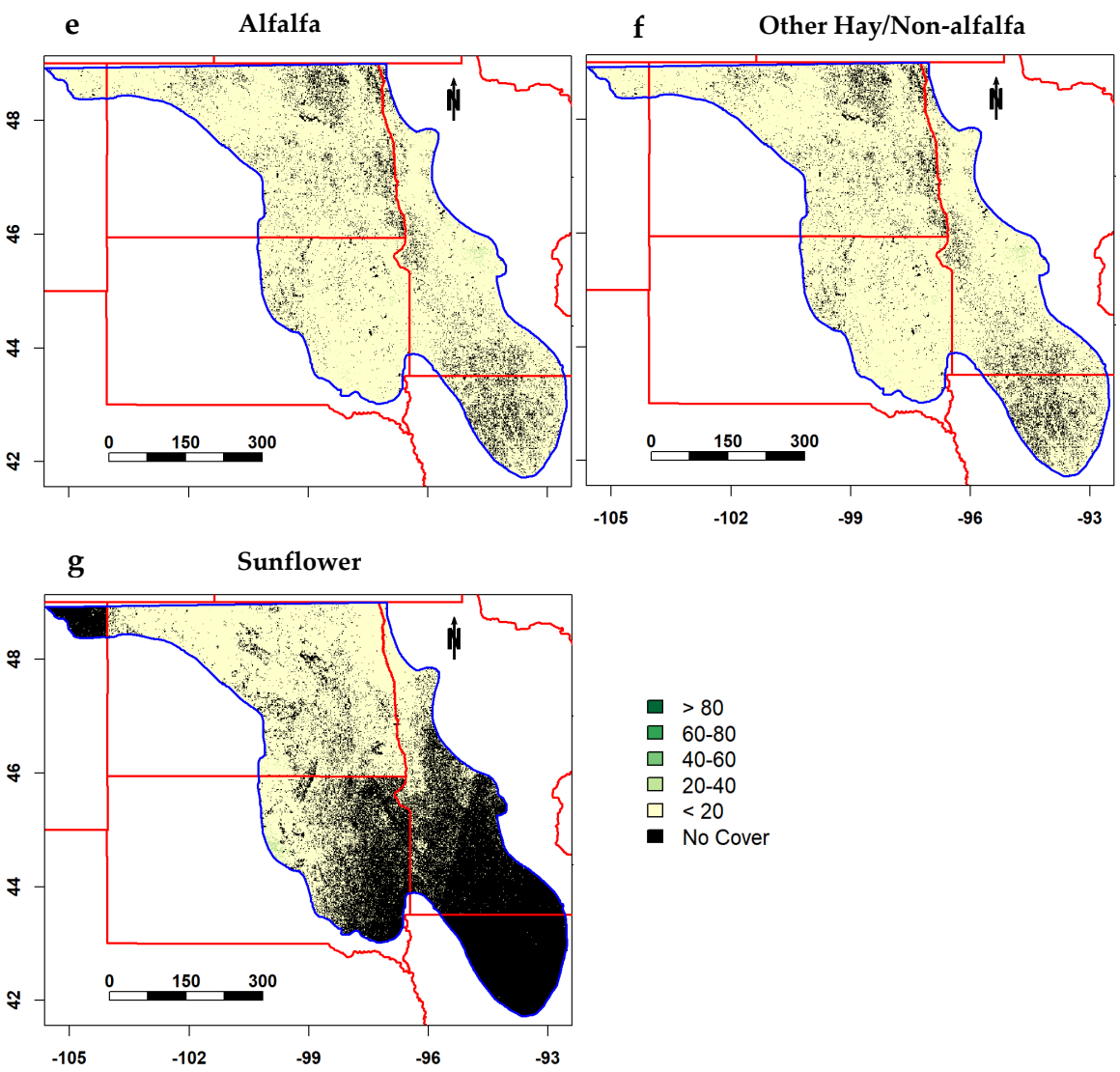

Figure S1, continued.

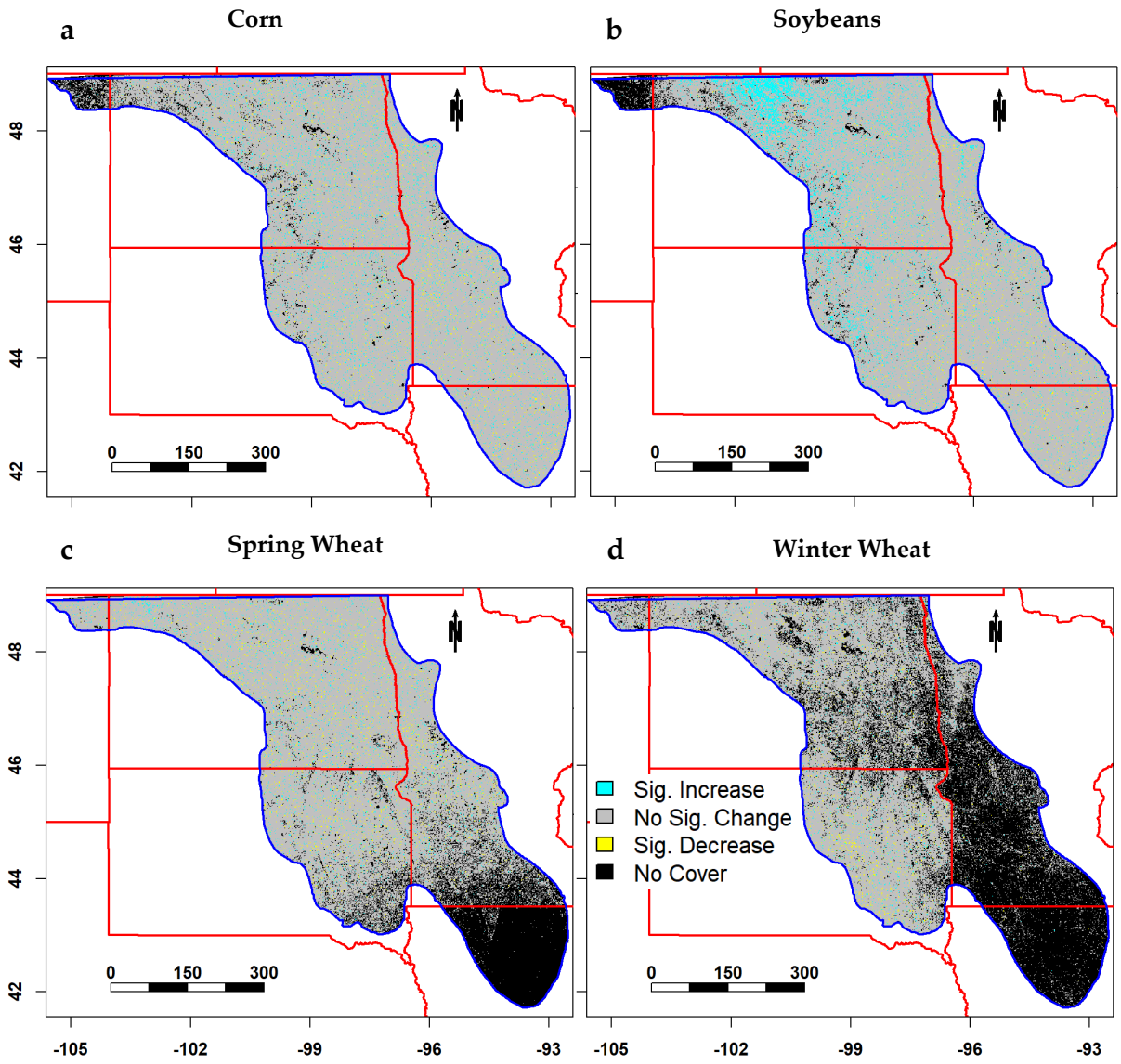

Figure S2. Mann-Kendall trend maps of cover classes between 2006 and 2018. Each cover class is divided into four categories: significant gain (cyan; $p<0.05$), non-significant change (gray; $p>0.05$), significant loss (yellow: $p<0.05$), with cover class absence in black. Quantitative details about these trends are presented in Table S1.

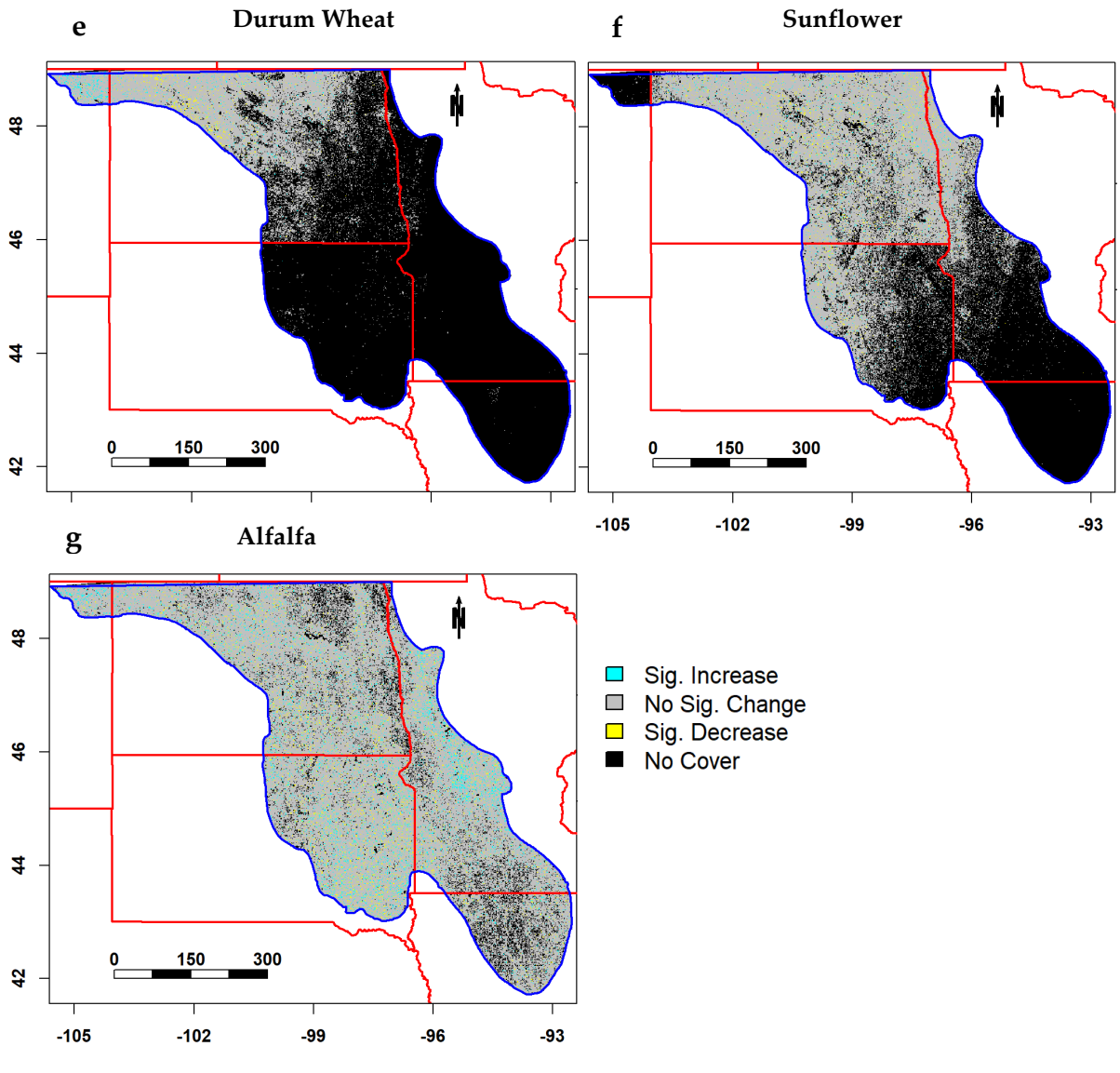

Figure S2, continued.

Table S1. Crop/land cover percentage (%) that showed a significant increase, significant decrease, net significant change, and no significant change using the Mann-Kendall trend test on CDL data for 2006 – 2018 for the US-PPR. This table support Figure 5 in the main text.

Crop/Land Cover Type	Significant Increase	Significant Decrease	Net Sig. Change	No Sig. Change
Corn	5.9	-1.1	+4.8	90.9
Soybeans	11.9	-0.7	+11.2	85.6
Corn & Soybeans	25.8	-2.3	+23.5	71.0
Spring Wheat	2.4	-4.3	-1.9	91.3
Winter Wheat	0.3	-3.4	-3.1	92.7
Durum Wheat	3.6	-4.6	-1.0	90.0
Sunflower	0.7	-5.4	-4.7	91.5
Alfalfa	15.3	-4.5	+10.8	78.1
Other Hay	14.8	0.0	+14.8	83.1
Wetlands	9.4	-4.9	+4.5	83.9
Grass/ Pasture	0.7	-29	-28.3	69.6

Table S2. Direct change analysis on the US-PPR CDL using the temporal endpoints of 2006 and 2018. Crop/land cover percentage (%) that increased, decreased, net change, no significant change, asymmetry ratio (AR), and predominant change (AR>2.0 → **increased**; AR<0.5 → ***decreased***; 0.5<AR<2.0 → mixed). NaN=Not a Number, due to division by zero; na is not available, due to this cover type not being mapped in 2006.

Cover Type	Increased	Decreased	Net Change	No Change	AR	Predominant Change
Corn	38.7	26.6	+12.1	34.7	1.45	mixed
Soybeans	41.9	27.6	+14.3	30.5	1.52	mixed
Corn & Soybeans	27.5	11.2	+16.3	61.3	**2.45**	**increased**
Spring Wheat	32.4	48.2	-15.8	19.4	0.67	mixed
Winter Wheat	22.0	73.9	-51.8	4.1	*0.30*	*decreased*
Durum Wheat	55.4	31.3	+24.1	13.3	1.77	mixed
Sunflower	21.8	75.3	-53.5	2.8	*0.29*	*decreased*
Alfalfa	54.5	39.3	+15.2	6.1	1.39	mixed
Other Hay	na	na	na	na	na	na
Wetlands	45.2	43.9	+1.3	10.9	1.03	mixed
Grass/ Pasture	19.0	38.1	-19.0	42.9	0.50	mixed

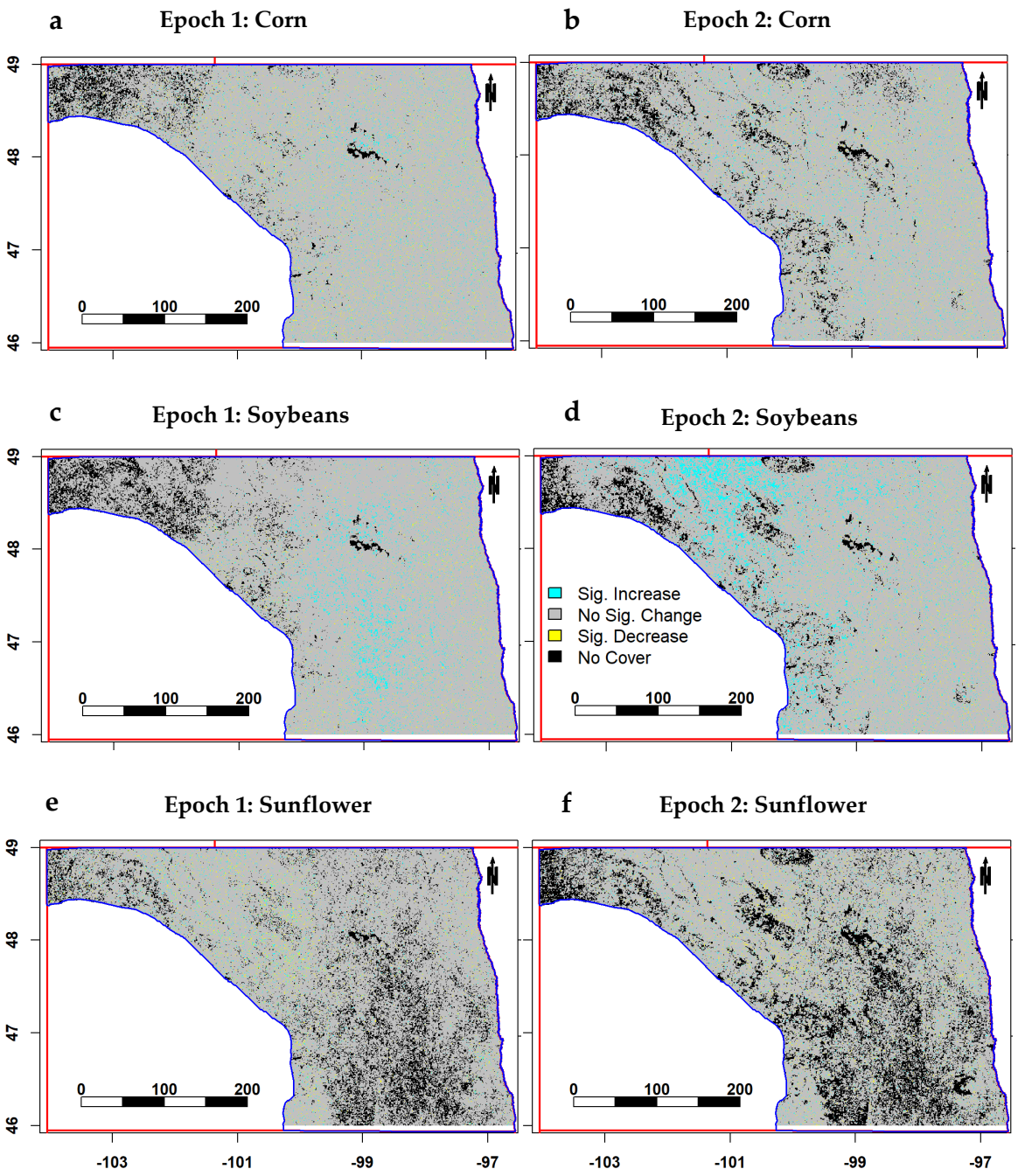

Figure S3. Mann-Kendall trend maps of cover classes for two epochs (Epoch 1: 1998 – 2007 and Epoch 2: 2008 – 2017). Each cover class is divided into four categories: significant gain (cyan; $p<0.05$), non-significant change (gray; $p>0.05$), significant loss (yellow; $p<0.05$), with cover class absence in black. Quantitative details about these trends are presented in Table S3.

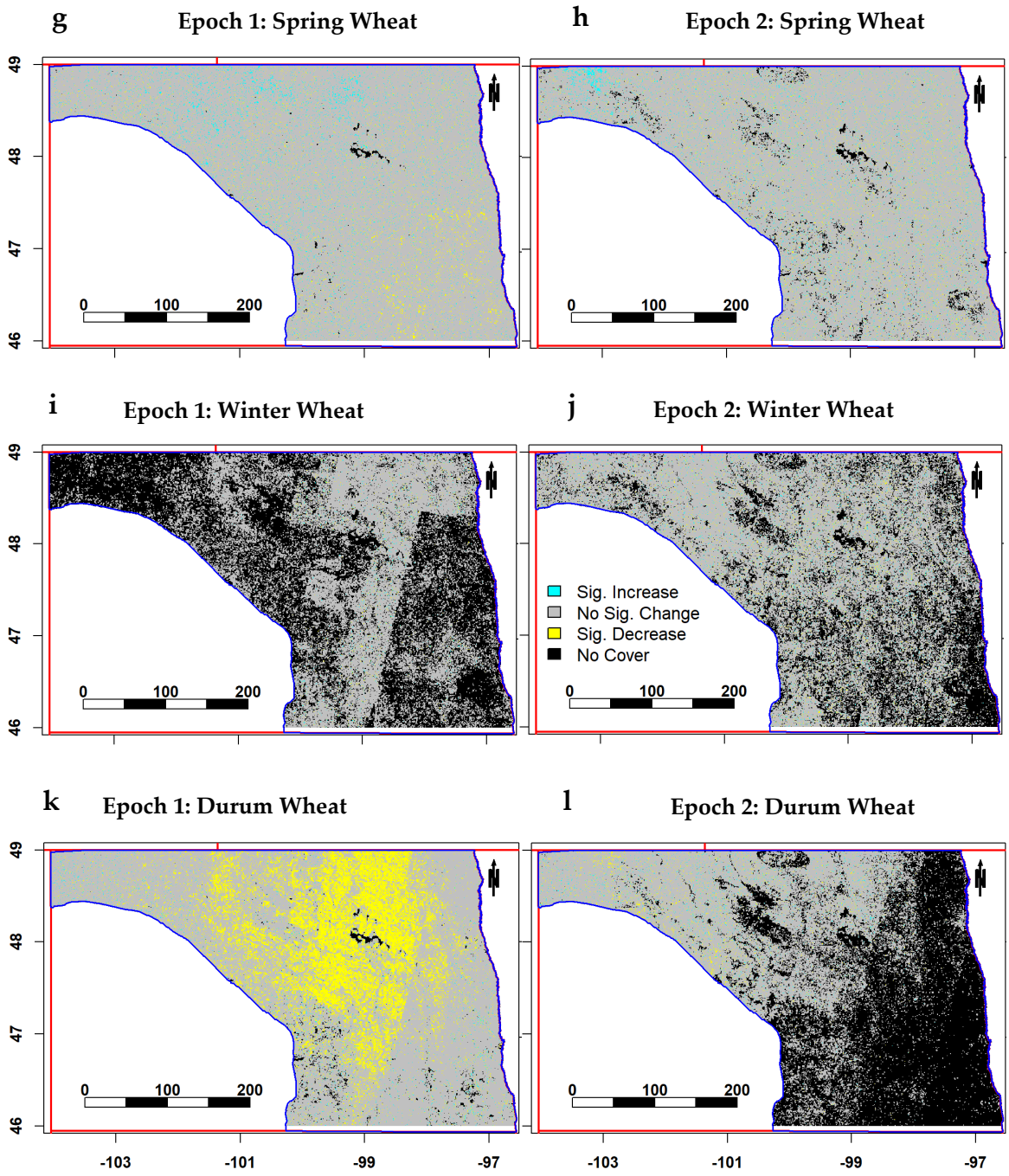

Figure S3, continued

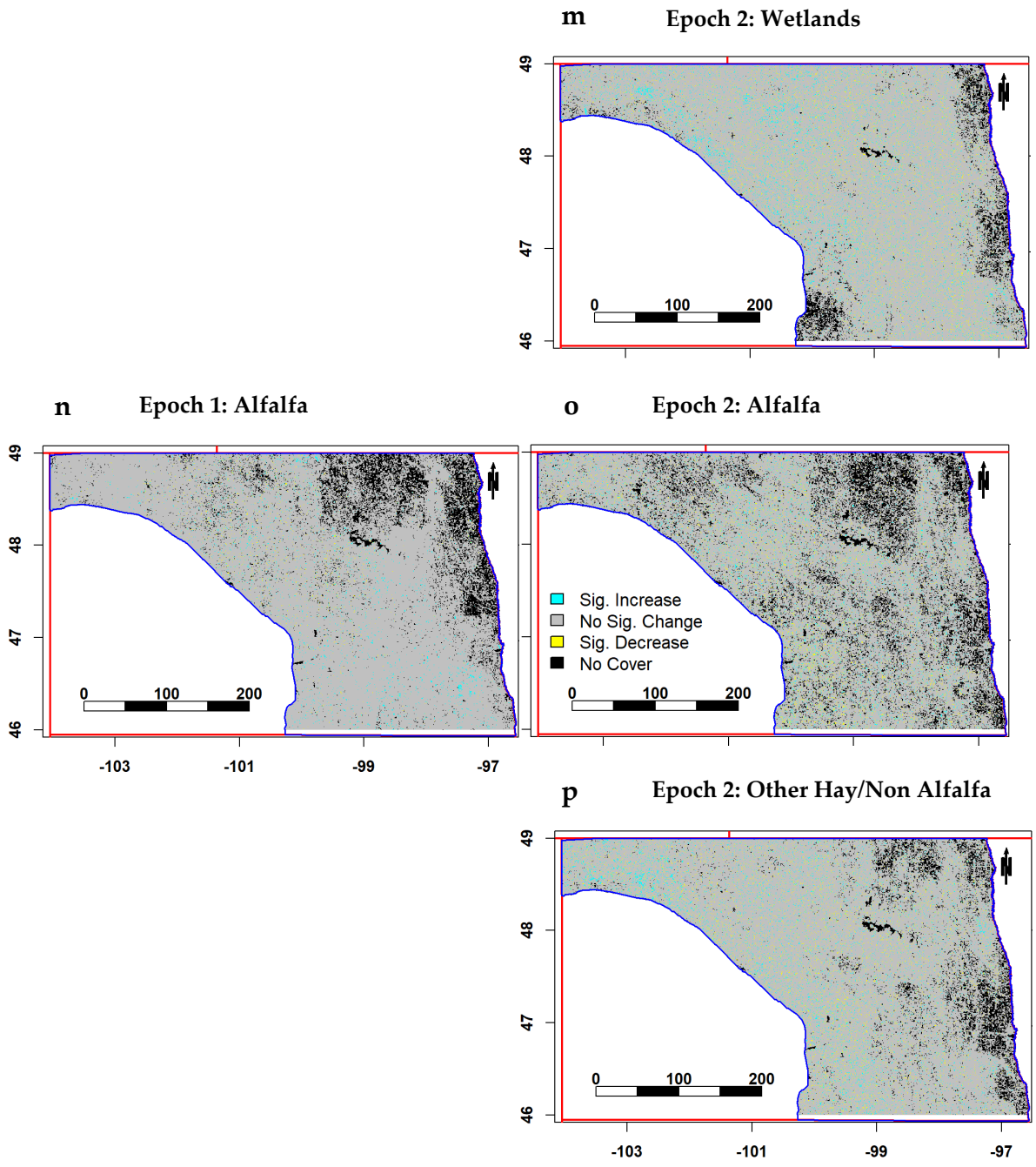

Figure S3, continued. Note that there are no full data in Epoch 1 for either Wetlands or Other Hay/Non-Alfalfa.

149 **Table S3.** Mann-Kendall trend test crop/land cover area and percentage (%) significant changes ($p <$
150 0.05) using CDL data two epochs (E1=1998 – 2007 and E2=2008 – 2017) for the North Dakotan portion
151 of the US-PPR. Significant increasing (gains), decreasing (losses), and net change trends are presented
152 for each crop/land cover for each epoch. This table supports Figure 7 in the main text.

Crop/Land Cover Type	Epoch	Significant Increase	Significant Decrease	Net Sig. Change	No Sig. Change
Corn	E1	2.9	-0.7	+2.2	94.6
	E2	5.0	-0.5	+4.4	92.8
Soybeans	E1	7.0	-0.2	+6.8	91.4
	E2	13.0	-0.3	+12.6	85.6
Corn & Soybeans	E1	11.1	-0.4	+10.7	87.2
	E2	17.8	-0.5	+17.3	80.9
Spring Wheat	E1	4.0	-3.3	+0.7	91.4
	E2	2.5	-2.1	+0.4	93.7
Winter Wheat	E1	1.3	0.0	+1.3	98.7
	E2	0.0	-2.2	-2.2	96.3
Durum Wheat	E1	0.1	-30.6	-30.6	69.1
	E2	0.9	-3.6	-2.7	93.9
Sunflower	E1	0.7	-2.2	-1.5	94.7
	E2	0.5	-2.5	-2.0	95.6
Alfalfa	E1	4.5	0.0	+4.5	95.1
	E2	6.5	-3.5	+3.0	88.6
Other Hay	E1	na	na	na	na
	E2	4.9	-1.4	+3.5	91.4
Wetlands	E1	na	na	na	na
	E2	7.2	-1.6	+5.6	89.7
Grass/ Pasture	E1	5.2	-5.6	-0.3	88.3
	E2	0.2	-31.0	-30.8	68.3

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164 **Table S4.** Direct change analysis on the ND-PPR CDL using the temporal endpoints in two epochs
165 (E1=1998–2007 and E2=2008–2017). Crop/land cover percentage (%) that increased, decreased, net
166 change, no significant change, asymmetry ratio (AR), and predominant change (AR>2.0 → **increased**;
167 AR<0.5 → ***decreased***; 0.5<AR<2.0 → mixed). NaN=Not a Number, due to division by zero; na=not
168 available, due to this cover type not available during epoch; ds=data suspect, due to apparent artifacts
169 in the cover type.

Cover Type	Epoch	Increased	Decreased	Net Change	No Change	AR	Predominant Change
Corn	E1	71.1	20.1	+51.0	8.8	3.54	**increased**
	E2	48.6	37.2	+11.4	14.1	1.31	mixed
Soybeans	E1	68.1	22.3	+45.8	9.7	3.05	**increased**
	E2	58.0	22.3	+35.7	19.7	2.60	**increased**
Corn & Soybeans	E1	66.8	14.8	+52.0	18.4	4.52	**increased**
	E2	47.0	14.2	+32.8	38.8	3.31	**increased**
Spring Wheat	E1	45.4	40.2	+5.2	14.4	1.13	mixed
	E2	34.8	47.8	-13.0	17.4	0.73	mixed
Winter Wheat	E1	ds	ds	ds	ds	ds	ds
	E2	4.0	95.8	-91.8	0.2	0.04	*decreased*
Durum Wheat	E1	16.6	70.7	-54.1	12.7	0.23	*decreased*
	E2	23.2	53.7	-30.5	23.0	0.43	*decreased*
Sunflower	E1	25.4	71.0	-45.6	3.7	0.36	*decreased*
	E2	13.9	84.4	-70.5	1.7	0.6	*decreased*
Alfalfa	E1	na	na	na	na	na	na
	E2	54.7	38.1	+16.6	7.2	1.44	mixed
Other Hay	E1	na	na	na	na	na	na
	E2	64.2	21.9	+42.2	13.9	2.92	**increased**
Wetlands	E1	na	na	na	na	na	na
	E2	54.0	22.2	+31.7	23.8	2.43	**increased**
Grass/ Pasture	E1	36.2	27.0	+9.1	36.8	1.34	mixed
	E2	8.4	33.6	-25.2	58.0	0.25	*decreased*

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