Multi-decadal Floodplain Classification and Trend Analysis in the Upper Columbia River Valley, British Columbia

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Supplementary Material

1. *Auxiliary Data*

The followings are detailed descriptions of wetland-related datasets.

(i) The Historical Global Land Cover (created by the Hermosilla et al., 2022) is a high spatial resolution (30m) land cover maps for Canada's ecosystems (1984-2019) (Overall accuracy of 80%). These time-series land cover maps were produced from annual time-series of Landsat image composites, forest change information, and ancillary topographic and hydrologic data. It was used (i) a refined training pool derived from existing land cover products using airborne and spaceborne measures of forest structure; (ii) selection of training samples proportionally to the land cover distribution using a distance weighted approach; and (iii) generation of regional classification models using a 150x150 km tiling system.

27 **2.** *Confusion matrix, total accuracy, omission, commission, and its corresponding classified raster*

28 **2.1. Season: April to mid-May**

29 **Table S1.** Confusion Matrix with commission and omission errors from April to mid-May 1984

Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	97	3	0	0	100	0.03		
Marsh	0	82	18	0	100	0.18		
Wet meadow	0	10	89	1	100	0.11	88.0%	0.84
Woody/Shrub	0	6	10	84	100	0.16		
Marginal total	97	101	117	85	400			
Omission Error	0	0.19	0.24	0.01				

■ Open Water

■ Marsh

■ Wet Meadow

■ Woody and Shrub

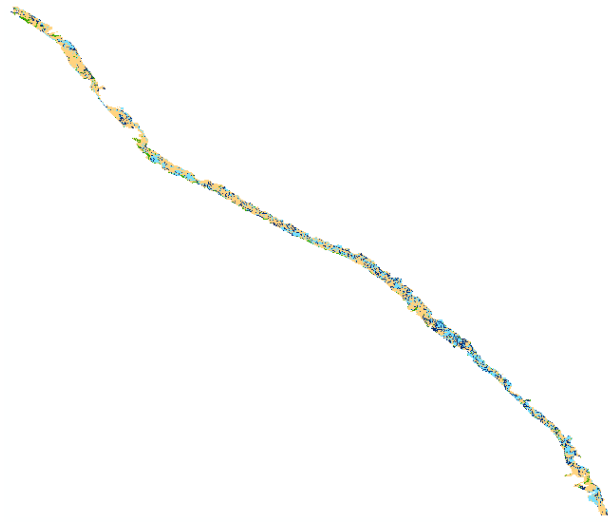
33 **Table S2.** Confusion Matrix with commission and omission errors from April to mid-May 1985

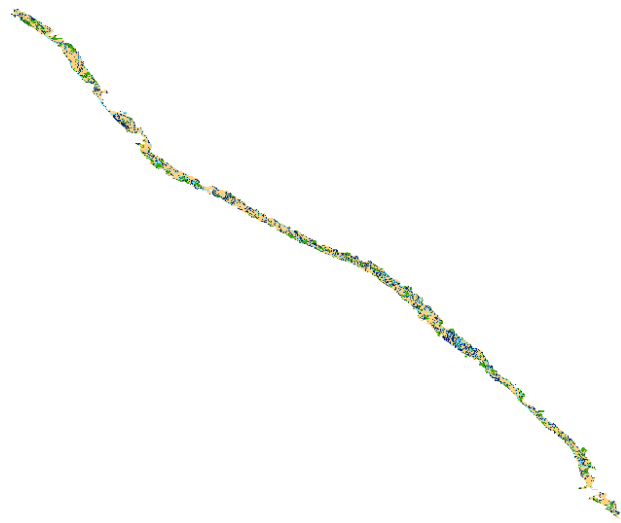
Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	97	3	0	0	100	0.03		
Marsh	0	82	18	0	100	0.18		
Wet meadow	0	10	89	1	100	0.11	88.0%	0.84
Woody/Shrub	0	6	10	84	100	0.16		
Marginal total	97	101	117	85	400			
Omission Error	0	0.19	0.24	0.01				

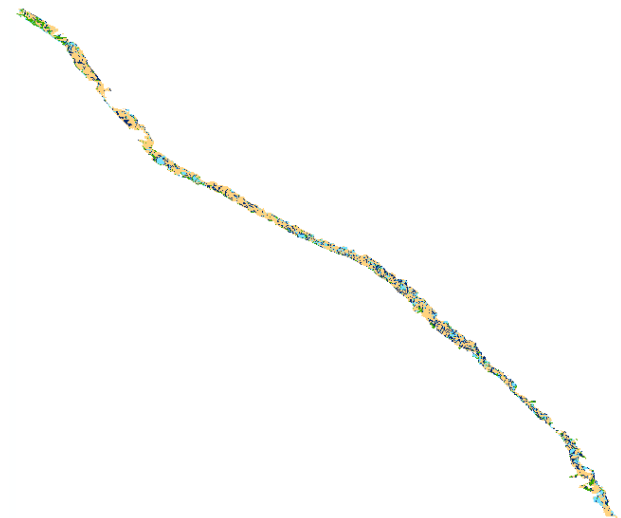
37 **Table S3.** Confusion Matrix with commission and omission errors from April to mid-May 1986

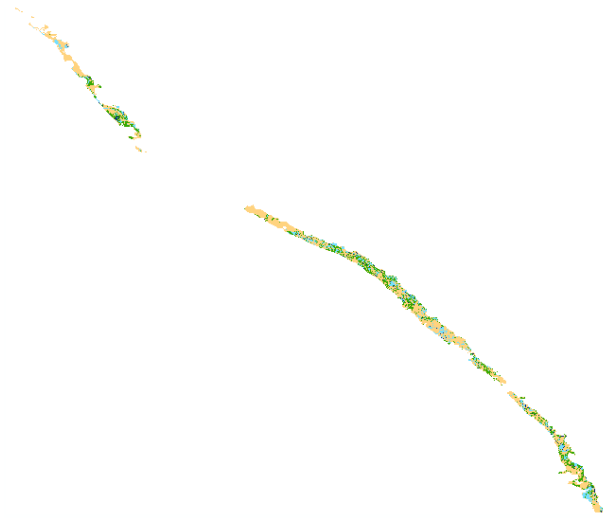
Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	97	3	0	0	100	0.03		
Marsh	0	82	18	0	100	0.18		
Wet meadow	0	10	89	1	100	0.11	88.0%	0.84
Woody/Shrub	0	6	10	84	100	0.16		
Marginal total	97	101	117	85	400			
Omission Error	0	0.19	0.24	0.01				

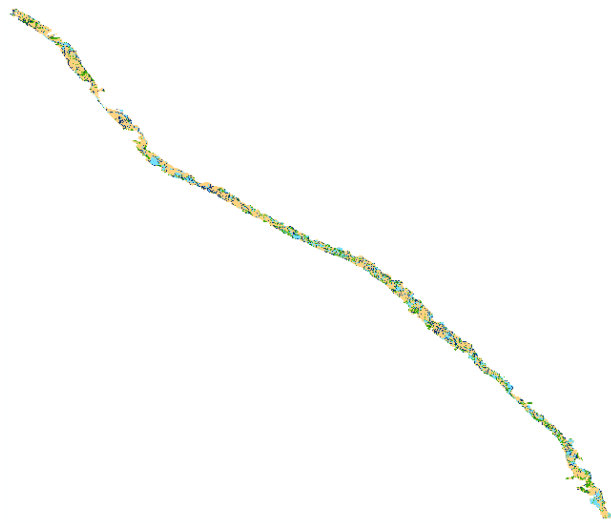
42 **Table S4.** Confusion Matrix with commission and omission errors from April to mid-May 1987

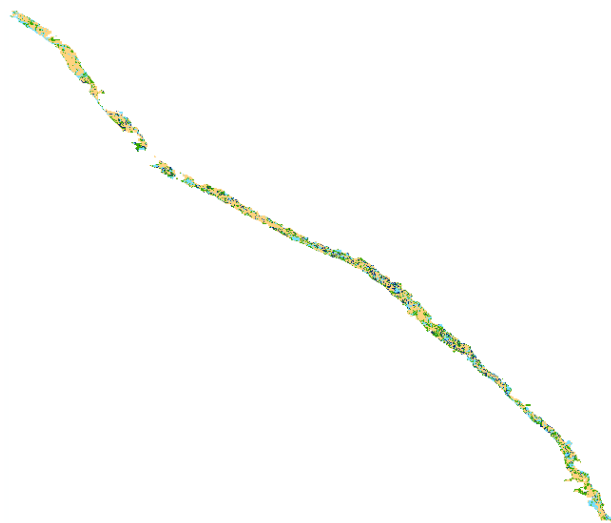
Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	92	8	0	0	100	0.08		
Marsh	0	80	20	0	100	0.20		
Wet meadow	0	10	87	3	100	0.13	87.5%	0.83
Woody/Shrub	0	6	3	91	100	0.09		
Marginal total	92	104	110	94	400			
Omission Error	0	0.23	0.21	0.03				

46 **Table S5.** Confusion Matrix with commission and omission errors from April to mid-May 1988

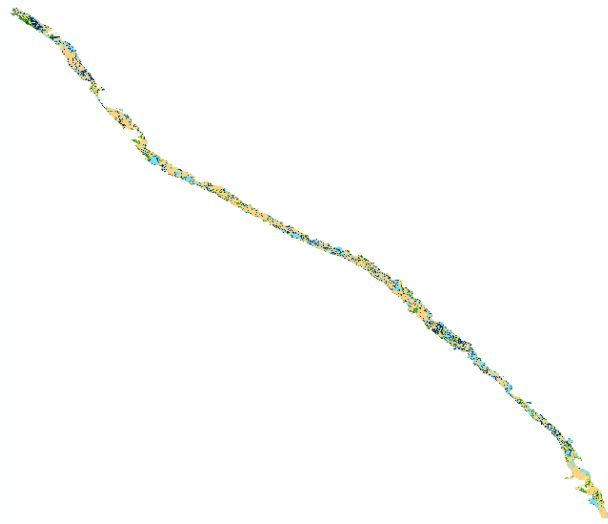
Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	95	5	0	0	100	0.05		
Marsh	0	78	18	4	100	0.22		
Wet meadow	0	10	78	12	100	0.22	84.8%	0.80
Woody/Shrub	0	7	5	88	100	0.12		
Marginal total	95	100	101	104	400			
Omission Error	0	0.22	0.23	0.15				

50 **Table S6.** Confusion Matrix with commission and omission errors from April to mid-May 1989

Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	96	4	0	0	100	0.04		
Marsh	3	75	12	10	100	0.25		
Wet meadow	2	10	82	6	100	0.18	84.3%	0.79
Woody/Shrub	0	7	9	84	100	0.16		
Marginal total	101	96	103	100	400			
Omission Error	0.05	0.22	0.20	0.16				

55   **Table S7.** Confusion Matrix with commission and omission errors from April to mid-May 1990

Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	90	6	4	0	100	0.10		
Marsh	3	86	4	7	100	0.14		
Wet meadow	2	10	86	2	100	0.14	88.3%	0.84
Woody/Shrub	0	4	5	91	100	0.09		
Marginal total	95	106	99	100	400			
Omission Error	0.05	0.19	0.13	0.09				

59   **Table S8.** Confusion Matrix with commission and omission errors from April to mid-May 1991

Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	86	5	9	0	100	0.14		
Marsh	5	88	3	4	100	0.12		
Wet meadow	2	7	89	2	100	0.11	87.3%	0.83
Woody/Shrub	0	9	5	86	100	0.14		
Marginal total	93	109	106	92	400			
Omission Error	0.08	0.19	0.16	0.07				

63   **Table S9.** Confusion Matrix with commission and omission errors from April to mid-May 1992

Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	51	5	4	0	60	0.15		
Marsh	3	50	0	7	60	0.17		
Wet meadow	0	3	54	3	60	0.10	86.7%	0.82
Woody/Shrub	0	2	5	53	60	0.12		
Marginal total	54	60	63	63	240			
Omission Error	0.06	0.17	0.14	0.16				

68 **Table S10.** Confusion Matrix with commission and omission errors from April to mid-May 1993

Classes	Water	Marsh	Wet meadow	Woody/ Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	50	5	5	0	60	0.17		
Marsh	3	50	0	7	60	0.17		
Wet meadow	0	3	54	3	60	0.10	85.4%	0.81
Woody/Shrub	0	3	6	51	60	0.15		
Marginal total	53	61	65	61	240			
Omission Error	0.06	0.18	0.17	0.16				

72 **Table S11.** Confusion Matrix with commission and omission errors from April to mid-May 1994

Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	55	3	2	0	60	0.08		
Marsh	1	54	0	5	60	0.10		
Wet meadow	0	4	52	4	60	0.13	88.3%	0.84
Woody/Shrub	0	4	5	51	60	0.15		
Marginal total	56	65	59	60	240			
Omission Error	0.02	0.17	0.12	0.15				

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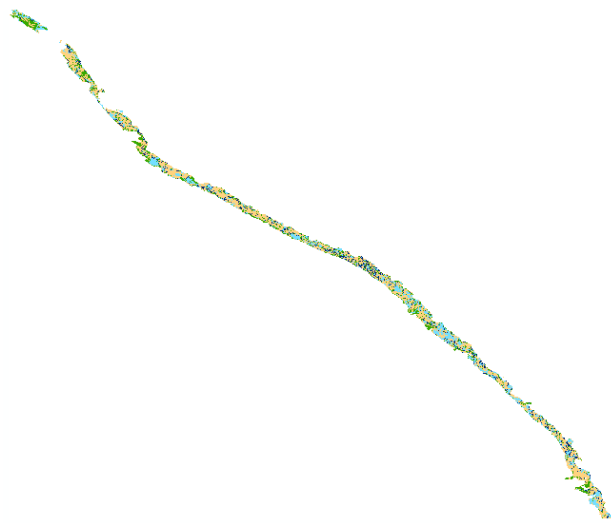
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76   **Table S12.** Confusion Matrix with commission and omission errors from April to mid-May 1995

Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	53	5	2	0	60	0.12		
Marsh	1	53	1	5	60	0.12		
Wet meadow	0	5	50	5	60	0.17	87.9%	0.84
Woody/Shrub	0	3	2	55	60	0.08		
Marginal total	54	66	55	65	240			
Omission Error	0.02	0.20	0.09	0.15				

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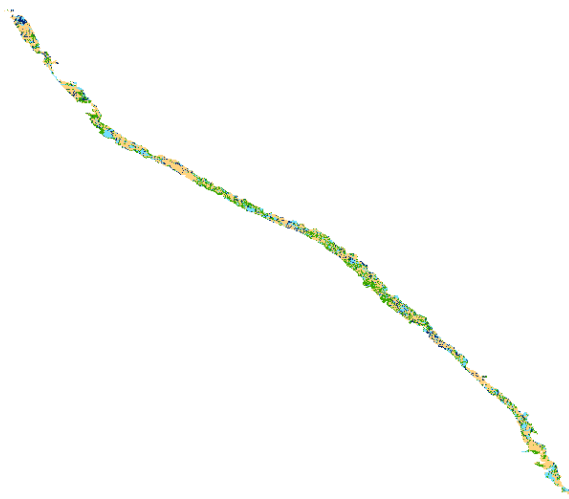
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81 **Table S13.** Confusion Matrix with commission and omission errors from April to mid-May 1996

Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	51	5	4	0	60	0.15		
Marsh	1	57	1	1	60	0.05		
Wet meadow	1	3	55	1	60	0.08	88.8%	0.85
Woody/Shrub	0	5	5	50	60	0.17		
Marginal total	53	70	65	52	240			
Omission Error	0.04	0.19	0.15	0.04				

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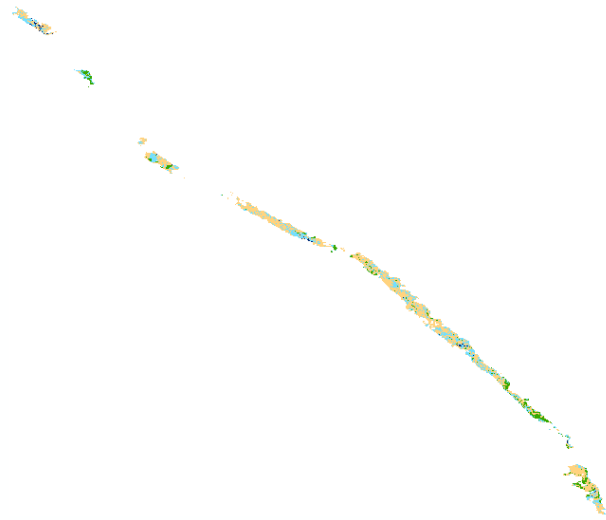
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85 **Table S14.** Confusion Matrix with commission and omission errors from April to mid-May 1997

Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	51	5	4	0	60	0.15		
Marsh	3	49	2	6	60	0.18		
Wet meadow	1	4	50	5	60	0.17	84.6%	0.79
Woody/Shrub	0	4	3	53	60	0.12		
Marginal total	55	62	59	64	240			
Omission Error	0.07	0.21	0.15	0.17				

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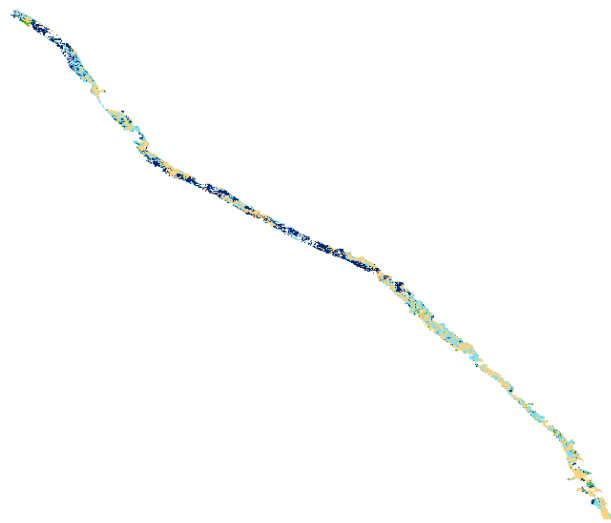
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89   **Table S15.** Confusion Matrix with commission and omission errors from April to mid-May 1998

Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	53	4	3	0	60	0.12		
Marsh	1	55	0	4	60	0.08		
Wet meadow	0	4	52	4	60	0.13	89.2%	0.86
Woody/Shrub	0	2	4	54	60	0.10		
Marginal total	54	65	59	62	240			
Omission Error	0.02	0.15	0.12	0.13				

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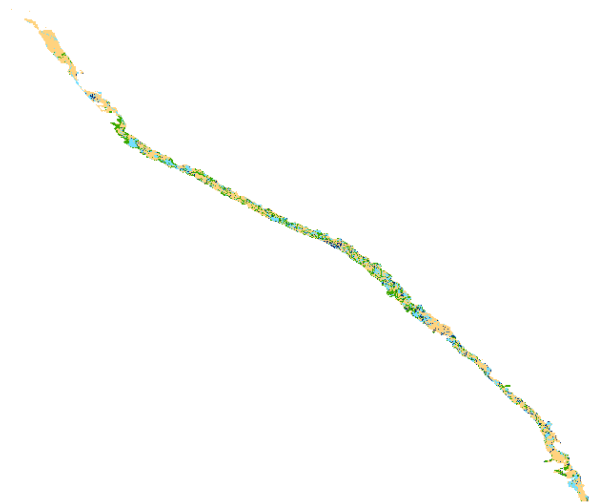
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94 **Table S16.** Confusion Matrix with commission and omission errors from April to mid-May 1999

Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	52	4	3	1	60	0.13		
Marsh	1	53	1	5	60	0.12		
Wet meadow	1	5	50	4	60	0.17	84.6%	0.79
Woody/Shrub	1	5	6	48	60	0.20		
Marginal total	55	67	60	58	240			
Omission Error	0.05	0.21	0.17	0.17				

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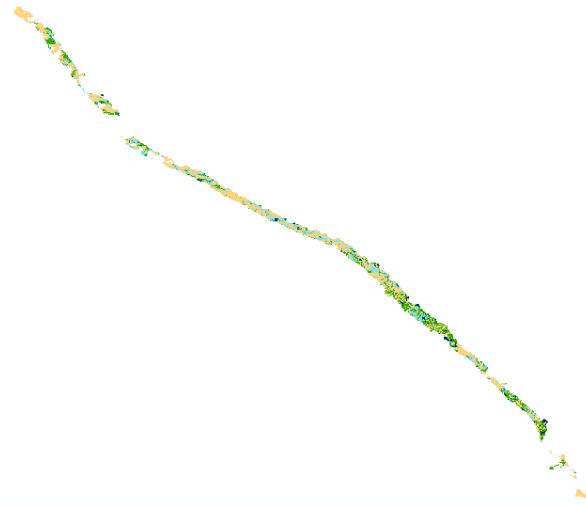
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98 **Table S17.** Confusion Matrix with commission and omission errors from April to mid-May 2001

Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	57	1	2	0	60	0.05		
Marsh	1	51	2	6	60	0.15		
Wet meadow	0	3	55	2	60	0.08	90.8%	0.88
Woody/Shrub	0	2	3	55	60	0.08		
Marginal total	58	57	62	63	240			
Omission Error	0.02	0.11	0.11	0.13				

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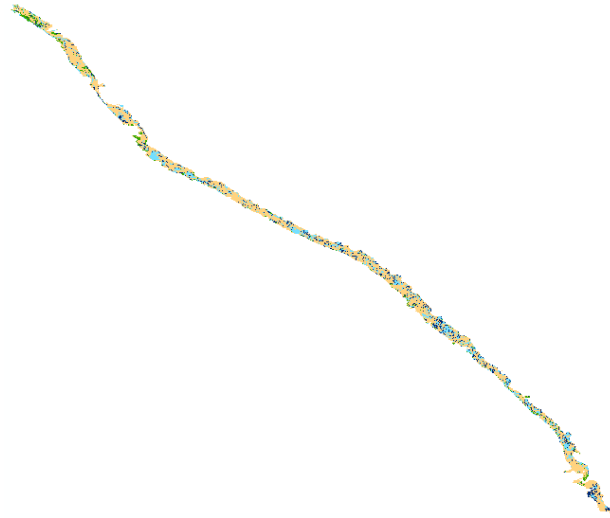
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102   **Table S18.** Confusion Matrix with commission and omission errors from April to mid-May 2002

Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	53	3	4	0	60	0.12		
Marsh	1	52	0	7	60	0.13		
Wet meadow	0	4	52	4	60	0.13	87.9%	0.84
Woody/Shrub	0	4	2	54	60	0.10		
Marginal total	54	63	58	65	240			
Omission Error	0.02	0.17	0.10	0.17				

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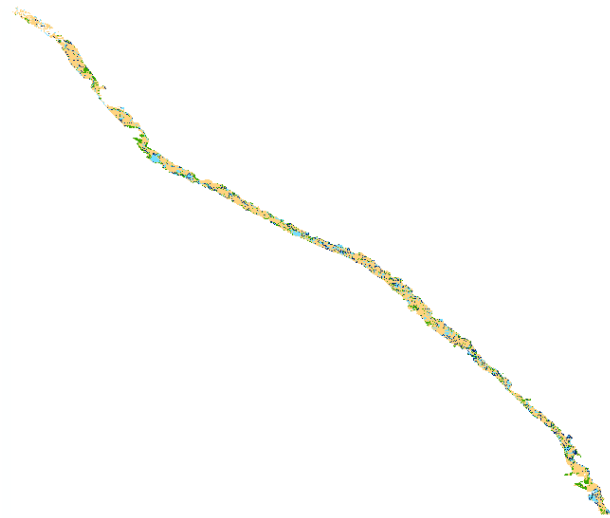
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Table S19. Confusion Matrix with commission and omission errors from April to mid-May 2003

Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	50	5	4	0	59	0.15		
Marsh	1	51	3	5	60	0.15		
Wet meadow	0	4	50	6	60	0.17	83.7%	0.78
Woody/Shrub	0	6	5	49	60	0.18		
Marginal total	51	66	62	60	239			
Omission Error	0.02	0.23	0.19	0.18				

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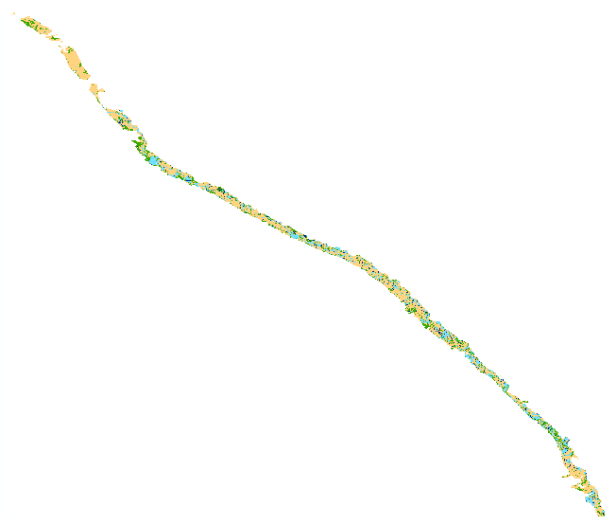
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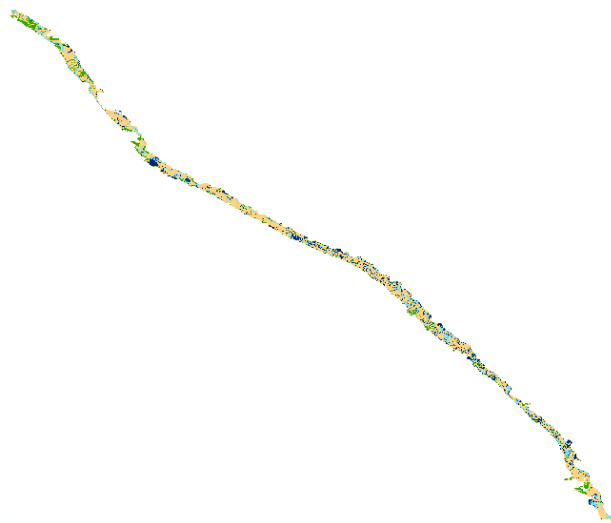
Table S20. Confusion Matrix with commission and omission errors from April to mid-May 2004

Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	50	4	6	0	60	0.17		
Marsh	1	51	1	7	60	0.15		
Wet meadow	0	4	52	4	60	0.13	85.8%	0.81
Woody/Shrub	0	4	3	53	60	0.12		
Marginal total	51	63	62	64	240			
Omission Error	0.02	0.19	0.16	0.17				

112

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115   **Table S21.** Confusion Matrix with commission and omission errors from April to mid-May 2005

Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	87	7	6	0	100	0.13		
Marsh	5	88	7	0	100	0.12		
Wet meadow	2	3	91	4	100	0.09	88.5%	0.85
Woody/Shrub	0	8	4	88	100	0.12		
Marginal total	94	106	108	92	400			
Omission Error	0.07	0.17	0.16	0.04				

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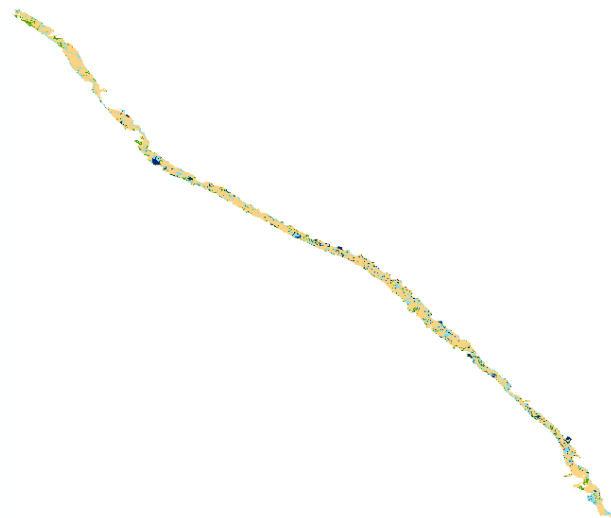
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120   **Table S22.** Confusion Matrix with commission and omission errors from April to mid-May 2006

Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	50	5	5	0	60	0.17		
Marsh	1	54	0	5	60	0.10		
Wet meadow	0	4	52	4	60	0.13	86.3%	0.82
Woody/Shrub	0	4	5	51	60	0.15		
Marginal total	51	67	62	60	240			
Omission Error	0.02	0.19	0.16	0.15				

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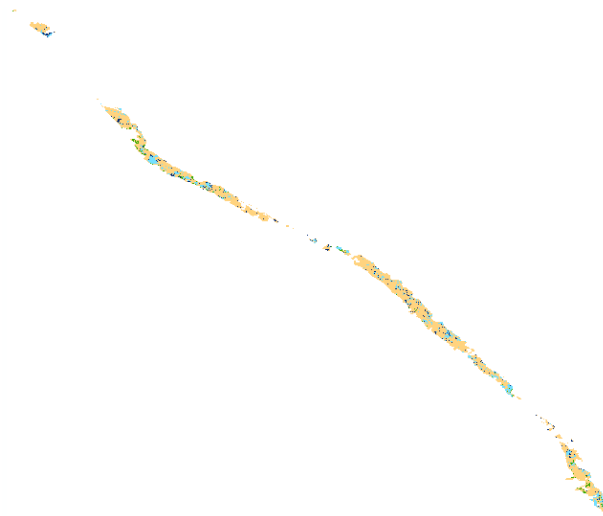
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124   **Table S23.** Confusion Matrix with commission and omission errors from April to mid-May 2007

Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	89	6	5	0	100	0.11		
Marsh	3	93	3	1	100	0.07		
Wet meadow	2	6	88	4	100	0.12	89.0%	0.85
Woody/Shrub	0	8	6	86	100	0.14		
Marginal total	94	113	102	91	400			
Omission Error	0.05	0.18	0.14	0.05				

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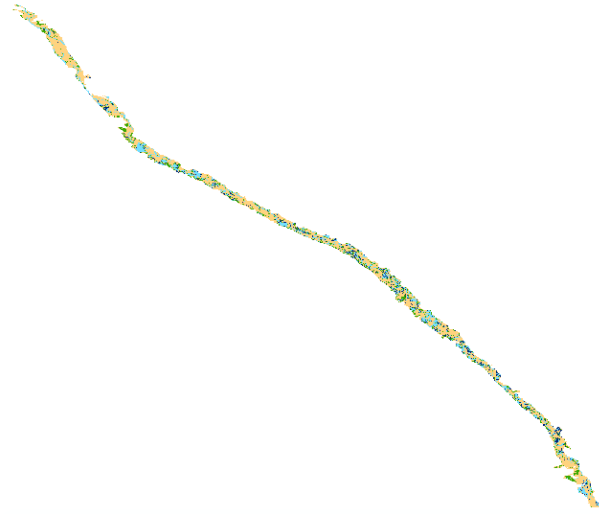
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128 **Table S24.** Confusion Matrix with commission and omission errors from April to mid-May 2008

Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	54	5	1	0	60	0.10		
Marsh	1	53	0	5	59	0.10		
Wet meadow	0	4	55	1	60	0.08	88.3%	0.84
Woody/Shrub	2	4	5	49	60	0.18		
Marginal total	57	66	61	55	239			
Omission Error	0.05	0.20	0.10	0.11				

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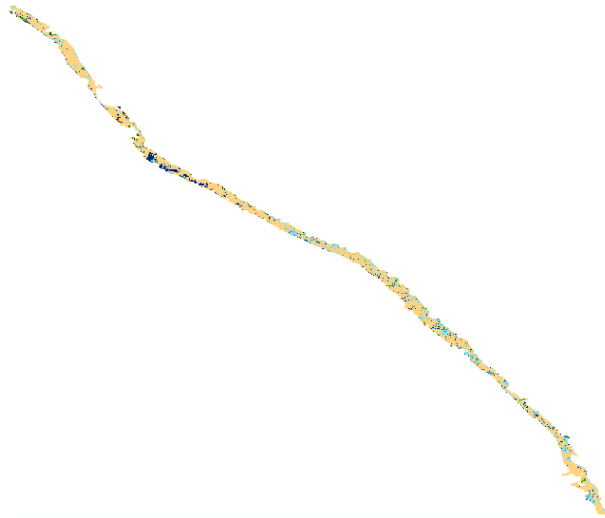
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133 **Table S25.** Confusion Matrix with commission and omission errors from April to mid-May 2009

Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	88	4	8	0	100	0.12		
Marsh	2	91	3	4	100	0.09		
Wet meadow	4	5	83	8	100	0.17	87.8%	0.84
Woody/Shrub	0	2	9	89	100	0.11		
Marginal total	94	102	103	101	400			
Omission Error	0.06	0.11	0.19	0.12				

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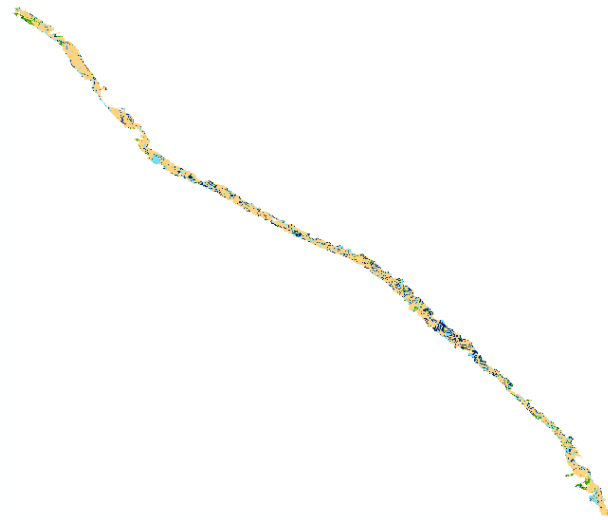
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137 **Table S26.** Confusion Matrix with commission and omission errors from April to mid-May 2010

Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	50	5	5	0	60	0.17		
Marsh	1	49	0	10	60	0.18		
Wet meadow	2	6	48	4	60	0.20	82.1%	0.76
Woody/Shrub	1	4	5	50	60	0.17		
Marginal total	54	64	58	64	240			
Omission Error	0.07	0.23	0.17	0.22				

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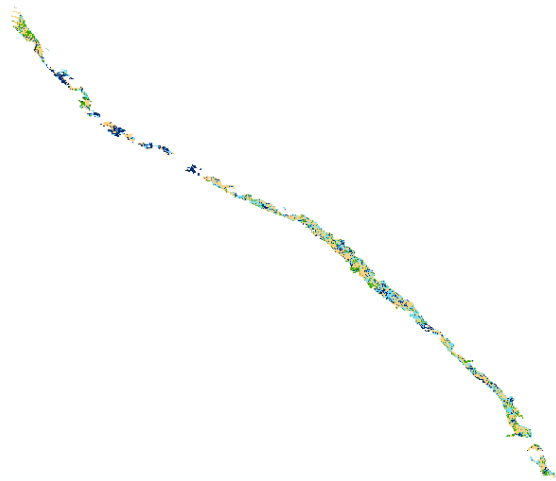
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141   **Table S27.** Confusion Matrix with commission and omission errors from April to mid-May 2011

Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	52	5	3	0	60	0.13		
Marsh	1	54	0	5	60	0.10		
Wet meadow	0	4	50	6	60	0.17	85.4%	0.81
Woody/Shrub	0	4	7	49	60	0.18		
Marginal total	53	67	60	60	240			
Omission Error	0.02	0.19	0.17	0.18				

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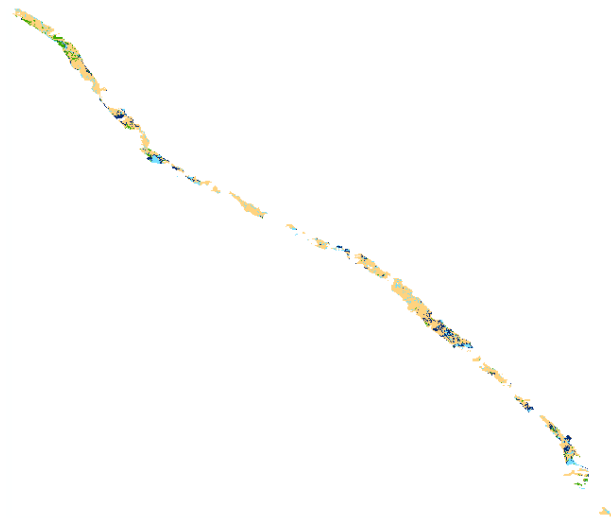
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146 **Table S28.** Confusion Matrix with commission and omission errors from April to mid-May 2013

Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	50	5	4	1	60	0.17		
Marsh	1	55	0	4	60	0.08		
Wet meadow	0	4	54	4	62	0.13	87.6%	0.83
Woody/Shrub	1	1	5	53	60	0.12		
Marginal total	52	65	63	62	242			
Omission Error	0.04	0.15	0.14	0.15				

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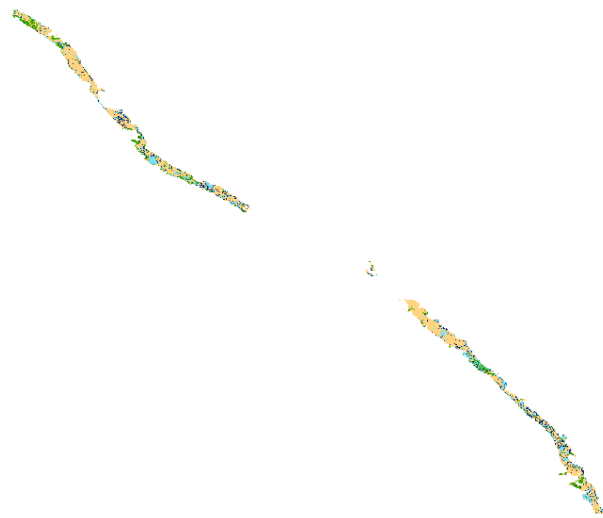
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150 **Table S29.** Confusion Matrix with commission and omission errors from April to mid-May 2014

Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	50	5	4	1	60	0.17		
Marsh	1	57	1	1	60	0.05		
Wet meadow	0	5	50	5	60	0.17	86.3%	0.82
Woody/Shrub	1	4	5	50	60	0.17		
Marginal total	52	71	60	57	240			
Omission Error	0.04	0.20	0.17	0.12				

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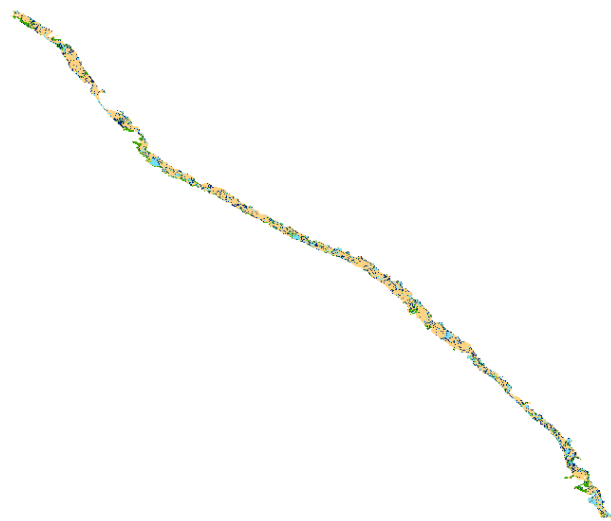
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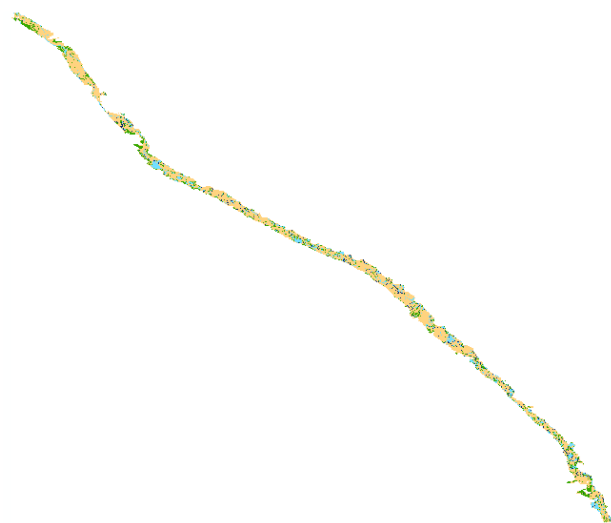
154 **Table S30.** Confusion Matrix with commission and omission errors from April to mid-May 2015

Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	51	5	4	0	60	0.15		
Marsh	2	53	0	5	60	0.12		
Wet meadow	0	4	50	6	60	0.17	85.0%	0.80
Woody/Shrub	0	5	5	50	60	0.17		
Marginal total	53	67	59	61	240			
Omission Error	0.04	0.21	0.15	0.18				

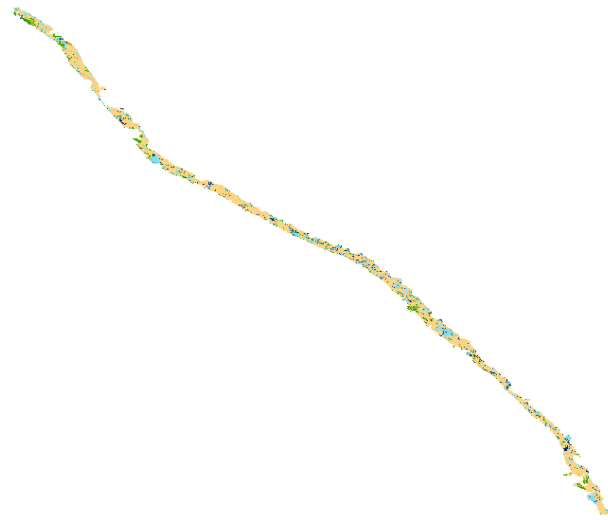
155

156

157

158

159   **Table S31.** Confusion Matrix with commission and omission errors from April to mid-May 2016

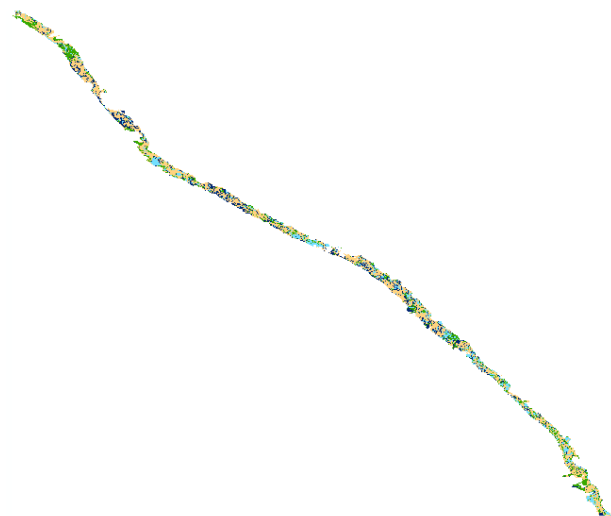
Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	89	3	8	0	100	0.11		
Marsh	3	92	5	0	100	0.08		
Wet meadow	4	4	89	3	100	0.11	90.0%	0.87
Woody/Shrub	0	3	7	90	100	0.10		
Marginal total	96	102	109	93	400			
Omission Error	0.07	0.10	0.18	0.03				

160

161

162

163   **Table S32.** Confusion Matrix with commission and omission errors from April to mid-May 2017

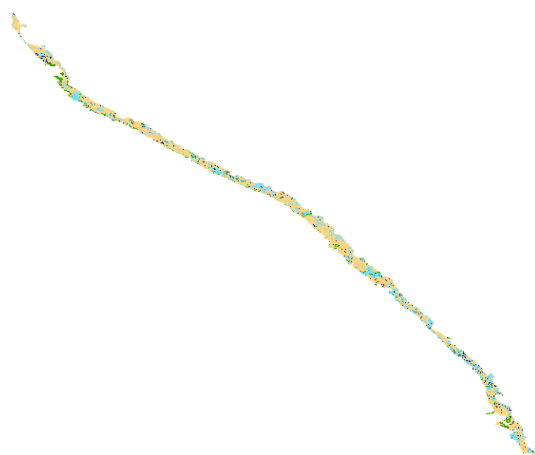
Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	91	2	7	0	100	0.09		
Marsh	3	87	10	0	100	0.13		
Wet meadow	5	5	88	2	100	0.12	88.0%	0.84
Woody/Shrub	0	4	10	86	100	0.14		
Marginal total	99	98	115	88	400			
Omission Error	0.08	0.11	0.23	0.02				

164

165

166

167   **Table S33.** Confusion Matrix with commission and omission errors from April to mid-May 2018

Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	88	4	8	0	100	0.12		
Marsh	2	89	9	0	100	0.11		
Wet meadow	5	7	85	3	100	0.15	86.5%	0.82
Woody/Shrub	0	5	11	84	100	0.16		
Marginal total	95	105	113	87	400			
Omission Error	0.07	0.15	0.25	0.03				

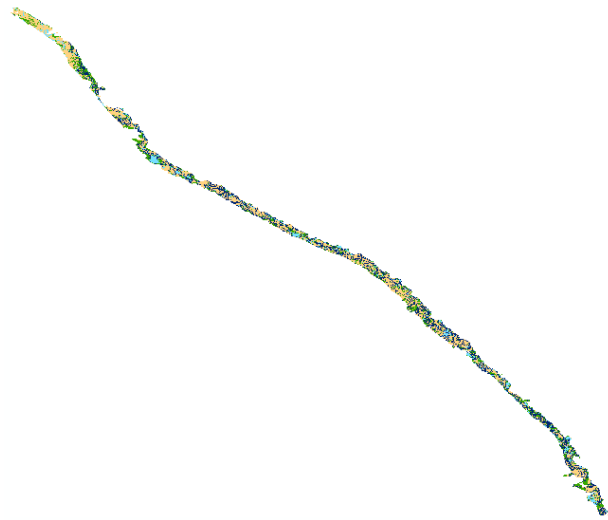
168

169

170

171

172 **Table S34.** Confusion Matrix with commission and omission errors from April to mid-May 2019

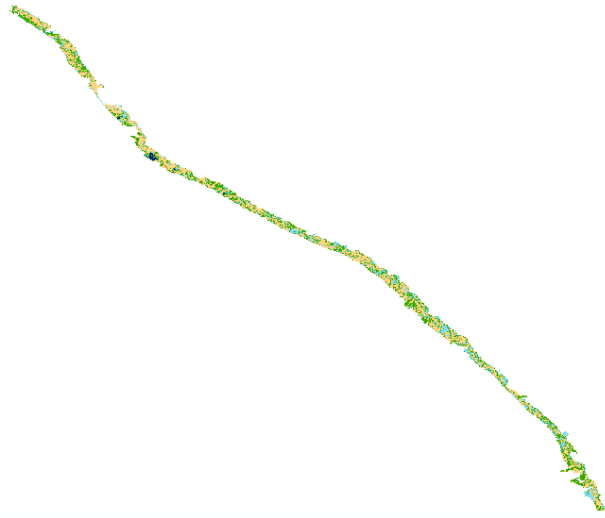
Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	90	3	7	0	100	0.10		
Marsh	2	91	7	0	100	0.09		
Wet meadow	4	7	87	2	100	0.13	89.3%	0.86
Woody/Shrub	0	3	8	89	100	0.11		
Marginal total	96	104	109	91	400			
Omission Error	0.06	0.13	0.20	0.02				

173

174

175

176 **Table S35.** Confusion Matrix with commission and omission errors from April to mid-May 2020

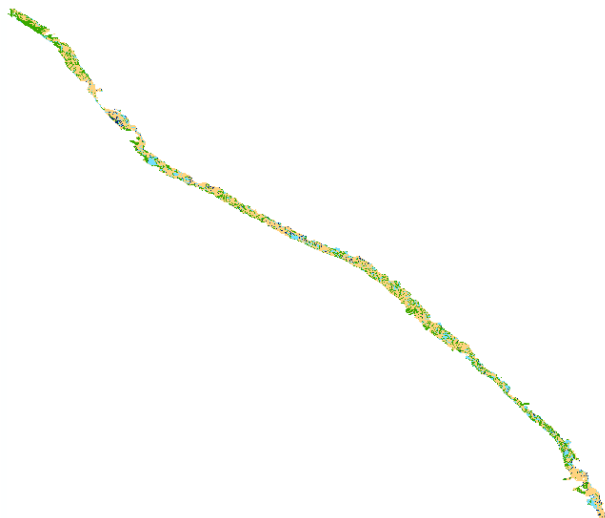
Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	88	4	8	0	100	0.12		
Marsh	6	89	5	0	100	0.11		
Wet meadow	5	8	85	2	100	0.15	87.5%	0.83
Woody/Shrub	0	6	6	88	100	0.12		
Marginal total	99	107	104	90	400			
Omission Error	0.11	0.17	0.18	0.02				

177

178

179

180   **Table S36.** Confusion Matrix with commission and omission errors from April to mid-May 2021

Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	88	5	7	0	100	0.12		
Marsh	6	88	6	0	100	0.12		
Wet meadow	3	5	90	2	100	0.10	88.3%	0.84
Woody/Shrub	0	6	7	87	100	0.13		
Marginal total	97	104	110	89	400			
Omission Error	0.09	0.15	0.18	0.02				

181

182

183

184

185 **Table S37.** Confusion Matrix with commission and omission errors from April to mid-May 2022

Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	90	4	6	0	100	0.10		
Marsh	3	92	5	0	100	0.08		
Wet meadow	4	4	88	4	100	0.12	89.8%	0.86
Woody/Shrub	0	5	6	89	100	0.11		
Marginal total	97	105	105	93	400			
Omission Error	0.07	0.12	0.16	0.04				

186

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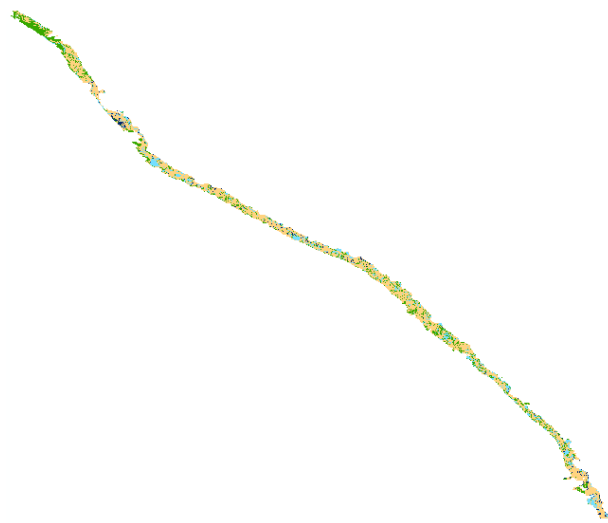
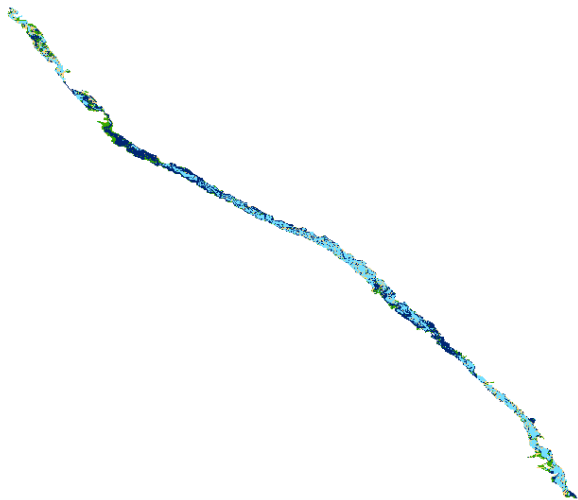
188

189 **2.2. Season: Late-May to July**

190

191 **Table S38.** Confusion Matrix with commission and omission errors from late-May to July 1984

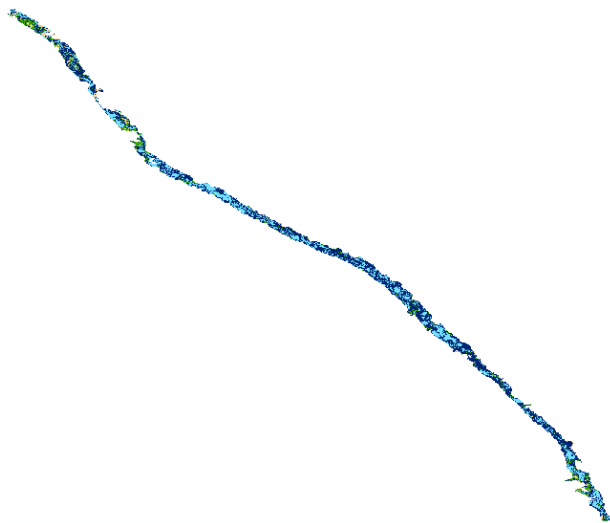
Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	97	3	0	0	100	0.03		
Marsh	6	89	5	0	100	0.11		
Wet meadow	0	4	93	3	100	0.07	91.3%	0.88
Woody/Shrub	0	6	8	86	100	0.14		
Marginal total	103	102	106	89	400			
Omission Error	0.06	0.13	0.12	0.03				

192

193

194

195   **Table S39.** Confusion Matrix with commission and omission errors from late-May to July 1986

Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	92	4	4	0	100	0.08		
Marsh	2	89	9	0	100	0.11		
Wet meadow	3	6	90	1	100	0.10	89.8%	0.86
Woody/Shrub	0	2	10	88	100	0.12		
Marginal total	97	101	113	89	400			
Omission Error	0.05	0.12	0.20	0.01				

196

197

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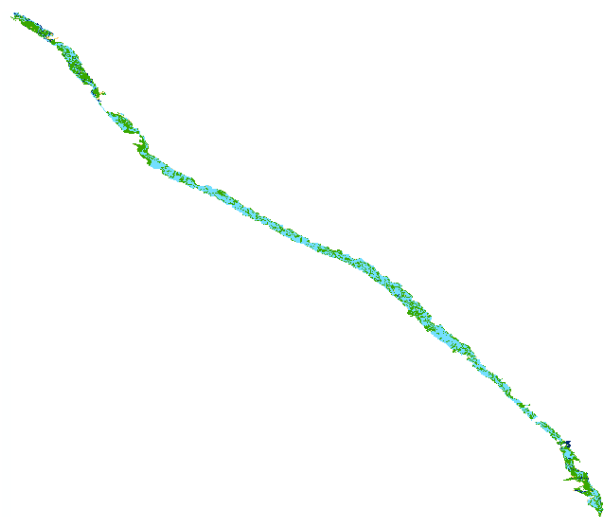
199

200 **Table S40.** Confusion Matrix with commission and omission errors from late-May to July 1987

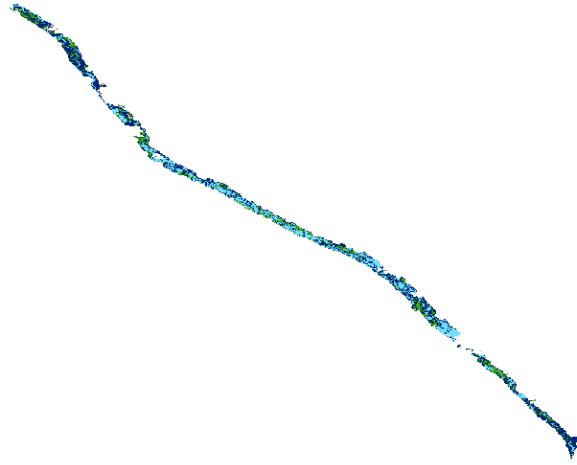
Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	94	4	2	0	100	0.06		
Marsh	10	80	10	0	100	0.20		
Wet meadow	0	10	87	3	100	0.13	88.0%	0.84
Woody/Shrub	0	6	3	91	100	0.09		
Marginal total	104	100	102	94	400			
Omission Error	0.10	0.20	0.15	0.03				

201

202

203

204 **Table S41.** Confusion Matrix with commission and omission errors from late-May to July 1988

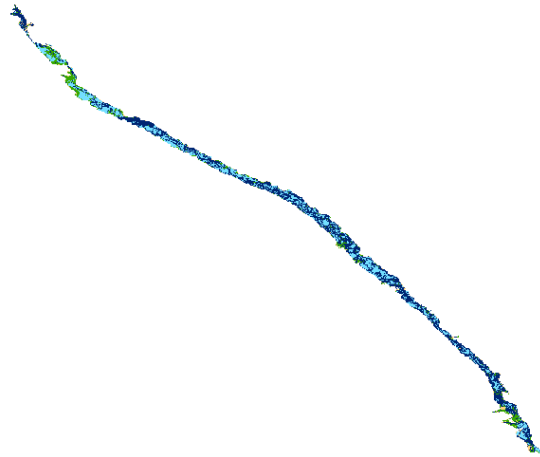
Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	95	5	0	0	100	0.05		
Marsh	0	82	12	6	100	0.18		
Wet meadow	0	9	83	8	100	0.17	87.8%	0.84
Woody/Shrub	0	4	5	91	100	0.09		
Marginal total	95	100	100	105	400			
Omission Error	0	0.18	0.17	0.13				

205

206

207

208 **Table S42.** Confusion Matrix with commission and omission errors from late-May to July 1990

Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	94	2	4	0	100	0.06		
Marsh	2	88	3	7	100	0.12		
Wet meadow	1	9	88	2	100	0.12	90.0%	0.87
Woody/Shrub	0	4	6	90	100	0.10		
Marginal total	97	103	101	99	400			
Omission Error	0.03	0.15	0.13	0.09				

209

210

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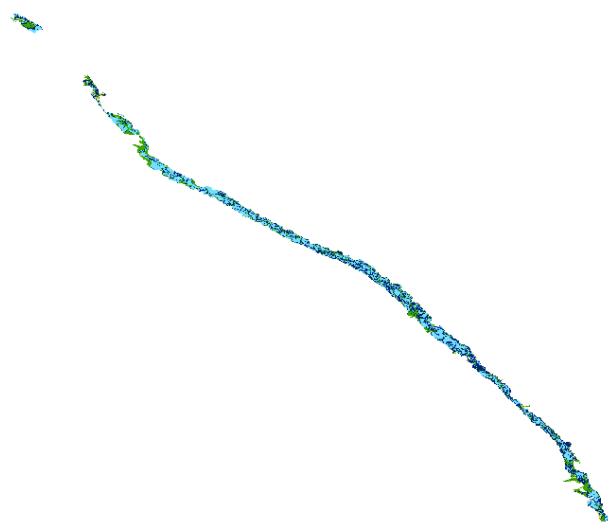
212

213   **Table S43.** Confusion Matrix with commission and omission errors from late-May to July 1991

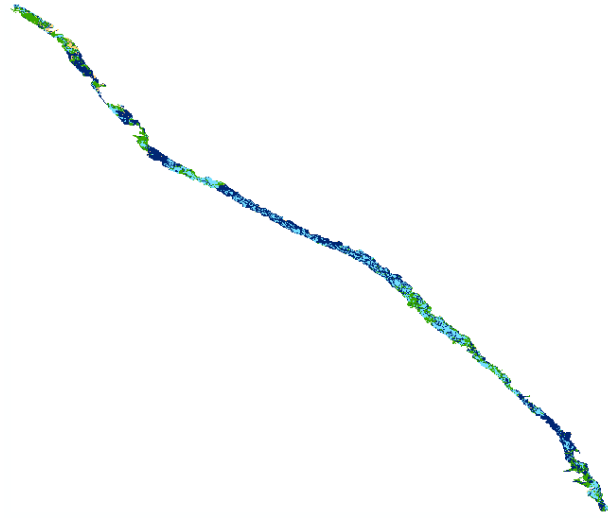
Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	90	6	4	0	100	0.10		
Marsh	6	86	4	4	100	0.14		
Wet meadow	0	7	91	2	100	0.09	89.0%	0.85
Woody/Shrub	0	7	4	89	100	0.11		
Marginal total	96	106	103	95	400			
Omission Error	0.06	0.19	0.12	0.06				

214

215

216

217   **Table S44.** Confusion Matrix with commission and omission errors from late-May to July 1992

Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	55	1	4	0	60	0.08		
Marsh	1	56	0	3	60	0.07		
Wet meadow	0	4	53	3	60	0.12	90.8%	0.88
Woody/Shrub	0	3	3	54	60	0.10		
Marginal total	56	64	60	60	240			
Omission Error	0.02	0.13	0.12	0.10				

218

219

220

221   **Table S45.** Confusion Matrix with commission and omission errors from late-May to July 1993

Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	56	1	3	0	60	0.07		
Marsh	1	57	0	2	60	0.05		
Wet meadow	0	2	54	4	60	0.10	90.4%	0.87
Woody/Shrub	0	5	5	50	60	0.17		
Marginal total	57	65	62	56	240			
Omission Error	0.02	0.12	0.13	0.11				

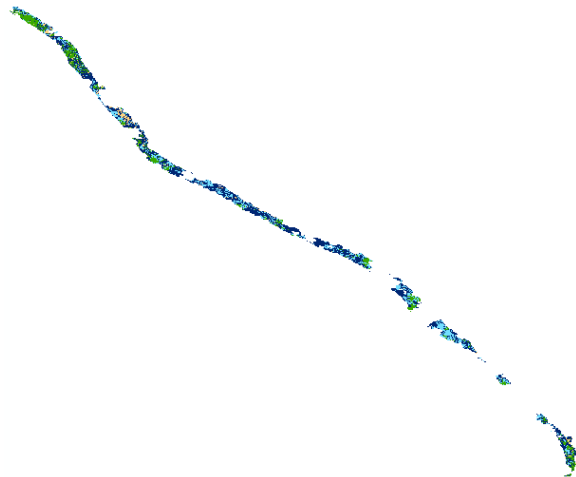
222

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Table S46. Confusion Matrix with commission and omission errors from late-May to July 1994

Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	57	1	2	0	60	0.05		
Marsh	1	55	4	0	60	0.08		
Wet meadow	0	3	54	3	60	0.10	90.4%	0.87
Woody/Shrub	0	4	5	51	60	0.15		
Marginal total	58	63	65	54	240			
Omission Error	0.02	0.13	0.17	0.06				

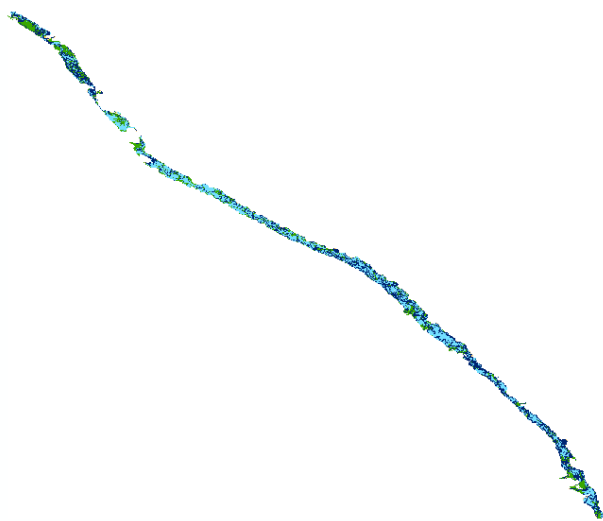
227

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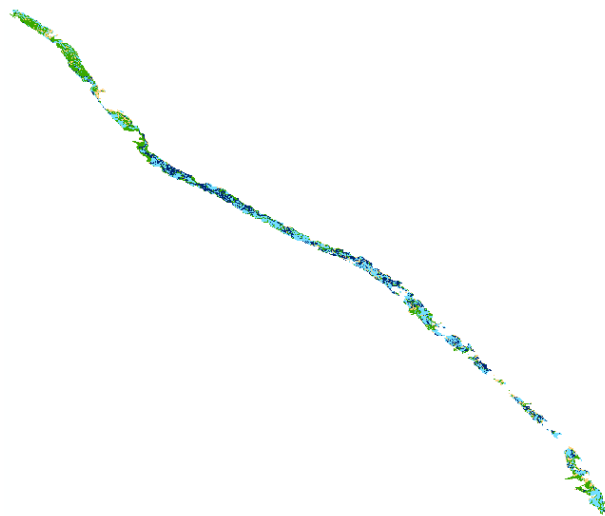
Table S47. Confusion Matrix with commission and omission errors from late-May to July 1995

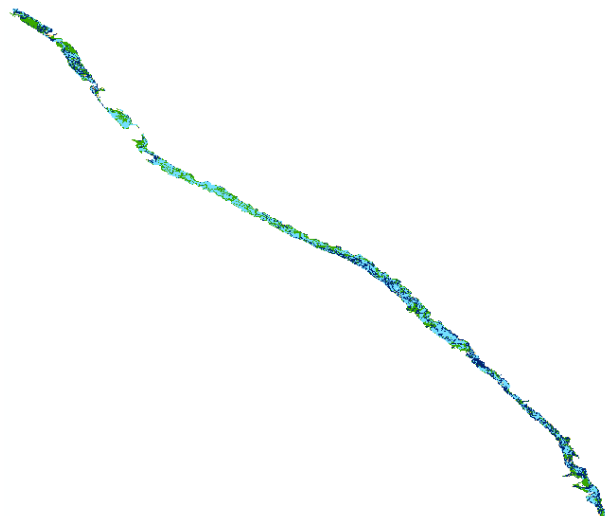
Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	56	3	1	0	60	0.07		
Marsh	1	55	0	4	60	0.08		
Wet meadow	0	4	52	4	60	0.13	89.6%	0.86
Woody/Shrub	0	4	4	52	60	0.13		
Marginal total	57	66	57	60	240			
Omission Error	0.02	0.17	0.09	0.13				

231

232

233

234 **Table S48.** Confusion Matrix with commission and omission errors from late-May to July 1996

Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	54	3	3	0	60	0.10		
Marsh	1	54	0	5	60	0.10		
Wet meadow	0	3	54	3	60	0.10	90.0%	0.87
Woody/Shrub	0	3	3	54	60	0.10		
Marginal total	55	63	60	62	240			
Omission Error	0.02	0.14	0.10	0.13				

235

236

237

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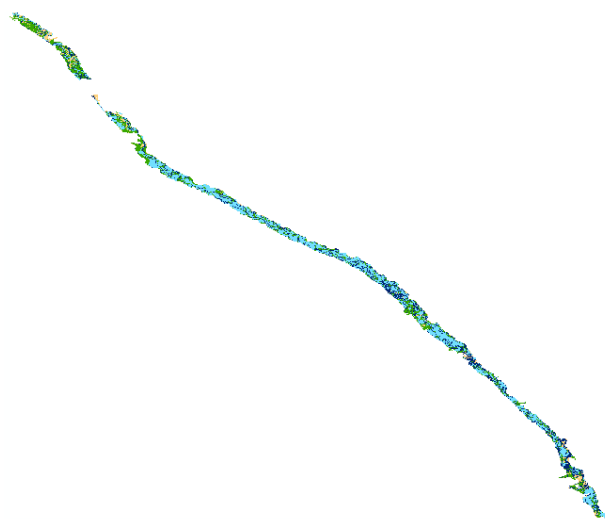
239   **Table S49.** Confusion Matrix with commission and omission errors from late-May to July 1998

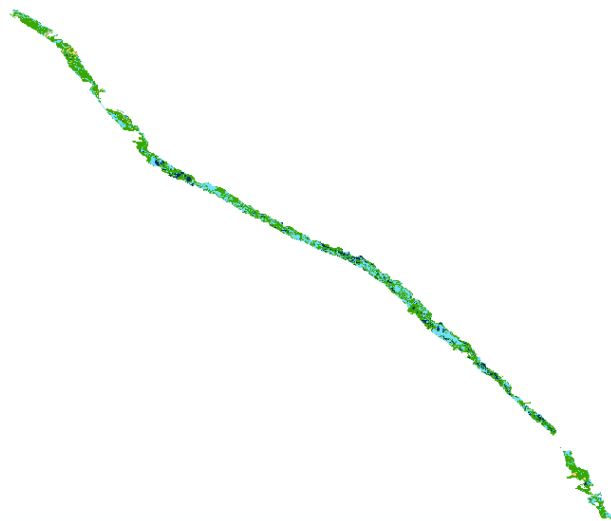
Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	55	3	2	0	60	0.08		
Marsh	1	55	0	4	60	0.08		
Wet meadow	2	4	50	4	60	0.17	87.5%	0.83
Woody/Shrub	1	4	5	50	60	0.17		
Marginal total	59	66	57	58	240			
Omission Error	0.07	0.17	0.12	0.14				

240

241

242

243   **Table S50.** Confusion Matrix with commission and omission errors from late-May to July 2001

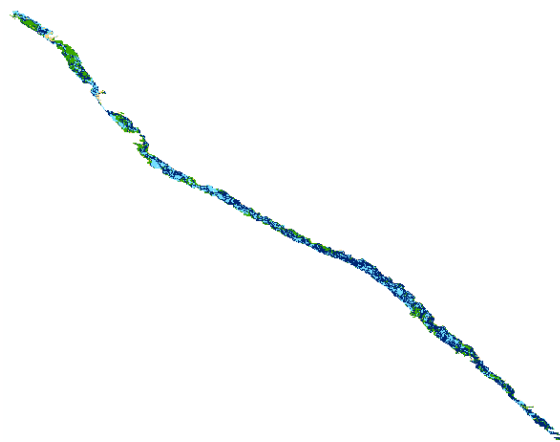
Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	52	4	4	0	60	0.13		
Marsh	1	51	3	5	60	0.15		
Wet meadow	0	3	53	4	60	0.12	86.7%	0.82
Woody/Shrub	0	3	5	52	60	0.13		
Marginal total	53	61	65	61	240			
Omission Error	0.02	0.16	0.18	0.15				

244

245

246

247 **Table S51.** Confusion Matrix with commission and omission errors from late-May to July 2002

Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	56	3	1	0	60	0.07		
Marsh	1	55	0	4	60	0.08		
Wet meadow	0	3	54	3	60	0.10	89.6%	0.86
Woody/Shrub	0	4	6	50	60	0.17		
Marginal total	57	65	61	57	240			
Omission Error	0.02	0.15	0.11	0.12				

248

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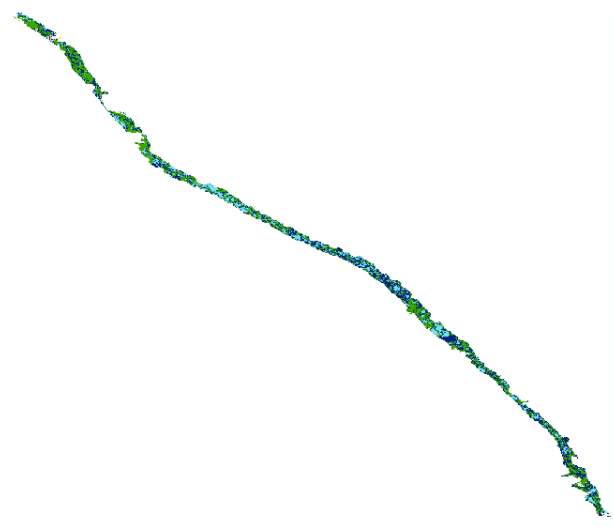
252   **Table S52.** Confusion Matrix with commission and omission errors from late-May to July 2004

Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	57	1	2	0	60	0.05		
Marsh	1	55	0	4	60	0.08		
Wet meadow	0	3	54	3	60	0.10	91.3%	0.88
Woody/Shrub	0	3	4	53	60	0.12		
Marginal total	58	62	60	60	240			
Omission Error	0.02	0.11	0.10	0.12				

253

254

255

256   **Table S53.** Confusion Matrix with commission and omission errors from late-May to July 2005

Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	89	2	9	0	100	0.11		
Marsh	6	84	10	0	100	0.16		
Wet meadow	3	7	85	5	100	0.15	87.0%	0.83
Woody/Shrub	0	6	4	90	100	0.10		
Marginal total	98	99	108	95	400			
Omission Error	0.09	0.15	0.21	0.05				

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259

260 **Table S54.** Confusion Matrix with commission and omission errors from late-May to July 2006

Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	58	1	1	0	60	0.03		
Marsh	1	55	0	4	60	0.08		
Wet meadow	0	2	54	4	60	0.10	91.7%	0.89
Woody/Shrub	0	4	3	53	60	0.12		
Marginal total	59	62	58	61	240			
Omission Error	0.02	0.11	0.07	0.13				

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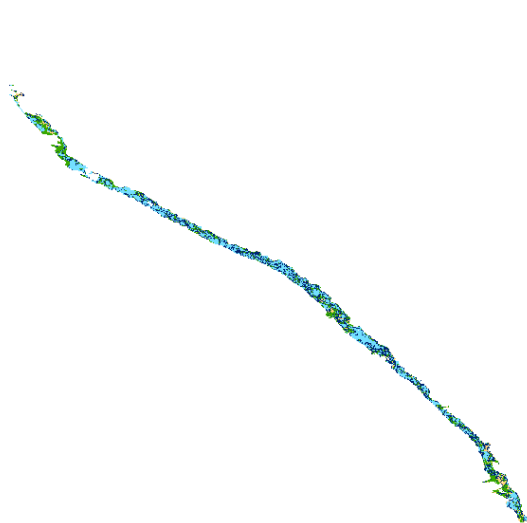
265 **Table S55.** Confusion Matrix with commission and omission errors from late-May to July 2009

Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	91	4	5	0	100	0.09		
Marsh	5	86	5	4	100	0.14		
Wet meadow	3	5	86	6	100	0.14	87.8%	0.84
Woody/Shrub	0	1	11	88	100	0.12		
Marginal total	99	96	107	98	400			
Omission Error	0.08	0.10	0.20	0.10				

266

267

268

269 **Table S56.** Confusion Matrix with commission and omission errors from late-May to July 2010

Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	54	2	4	0	60	0.10		
Marsh	1	55	0	4	60	0.08		
Wet meadow	0	3	53	4	60	0.12	89.6%	0.86
Woody/Shrub	0	4	3	53	60	0.12		
Marginal total	55	64	60	61	240			
Omission Error	0.02	0.14	0.12	0.13				

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273 **Table S57.** Confusion Matrix with commission and omission errors from late-May to July 2013

Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	54	5	1	0	60	0.10		
Marsh	1	54	0	5	60	0.10		
Wet meadow	0	3	55	2	60	0.08	90.8%	0.88
Woody/Shrub	0	2	3	55	60	0.08		
Marginal total	55	64	59	62	240			
Omission Error	0.02	0.16	0.07	0.11				

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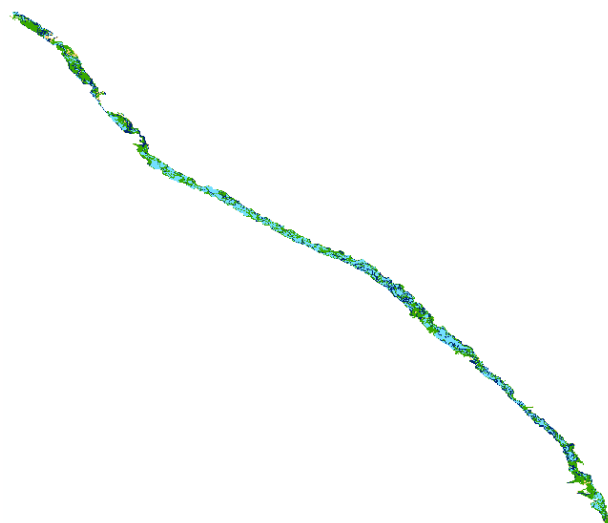
Table S58. Confusion Matrix with commission and omission errors from late-May to July 2014

Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	56	1	3	0	60	0.07		
Marsh	1	53	3	3	60	0.12		
Wet meadow	0	4	53	3	60	0.12	89.6%	0.86
Woody/Shrub	0	3	4	53	60	0.12		
Marginal total	57	61	63	59	240			
Omission Error	0.02	0.13	0.16	0.10				

279

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281

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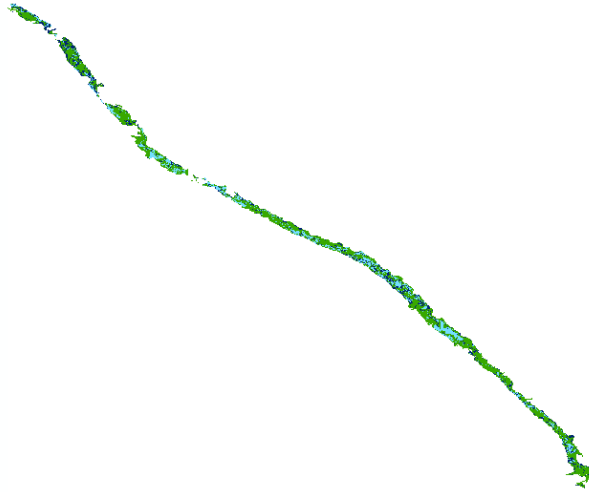
Table S59. Confusion Matrix with commission and omission errors from late-May to July 2015

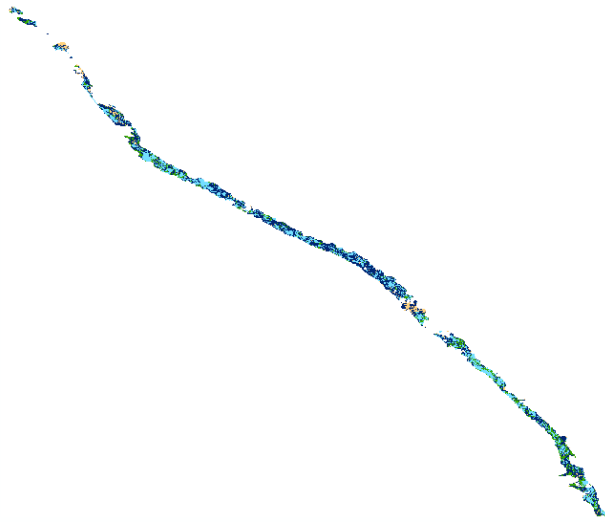
Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	55	1	4	0	60	0.08		
Marsh	1	55	0	4	60	0.08		
Wet meadow	0	4	53	3	60	0.12	90.4%	0.87
Woody/Shrub	0	5	1	54	60	0.10		
Marginal total	56	65	58	61	240			
Omission Error	0.02	0.15	0.09	0.11				

283

284

285

286 **Table S60.** Confusion Matrix with commission and omission errors from late-May to July 2016

Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	90	5	5	0	100	0.10		
Marsh	5	88	7	0	100	0.12		
Wet meadow	5	4	87	4	100	0.13	89.0%	0.85
Woody/Shrub	0	5	4	91	100	0.09		
Marginal total	100	102	103	95	400			
Omission Error	0.10	0.14	0.16	0.04				

287

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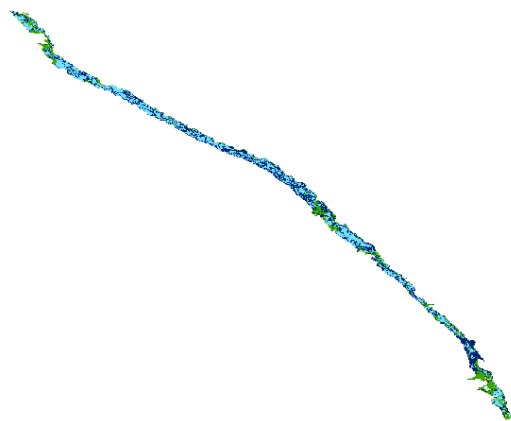
291   **Table S61.** Confusion Matrix with commission and omission errors from late-May to July 2017

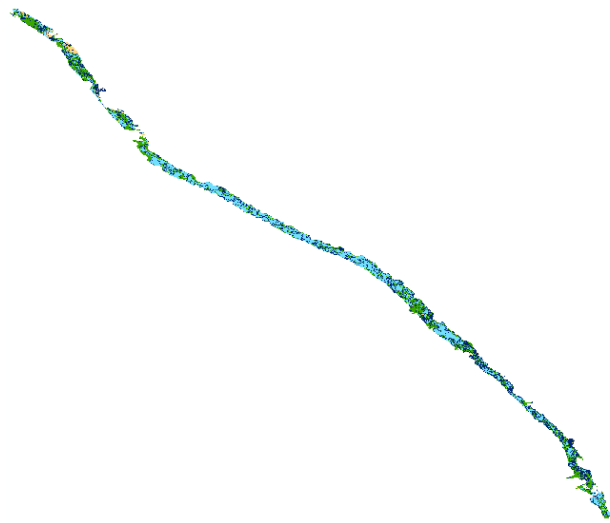
Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	92	4	4	0	100	0.08		
Marsh	5	86	9	0	100	0.14		
Wet meadow	5	5	88	2	100	0.12	88.8%	0.85
Woody/Shrub	0	5	6	89	100	0.11		
Marginal total	102	100	107	91	400			
Omission Error	0.10	0.14	0.18	0.02				

292

293

294

295   **Table S62.** Confusion Matrix with commission and omission errors from late-May to July 2018

Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	93	3	4	0	100	0.07		
Marsh	4	88	8	0	100	0.12		
Wet meadow	4	4	89	3	100	0.11	90.0%	0.87
Woody/Shrub	0	4	6	90	100	0.10		
Marginal total	101	99	107	93	400			
Omission Error	0.08	0.11	0.17	0.03				

296

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299

Table S63. Confusion Matrix with commission and omission errors from late-May to July 2019

Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	91	4	5	0	100	0.09		
Marsh	2	88	10	0	100	0.12		
Wet meadow	4	4	89	3	100	0.11	90.0%	0.87
Woody/Shrub	0	3	5	92	100	0.08		
Marginal total	97	99	109	95	400			
Omission Error	0.06	0.11	0.18	0.03				

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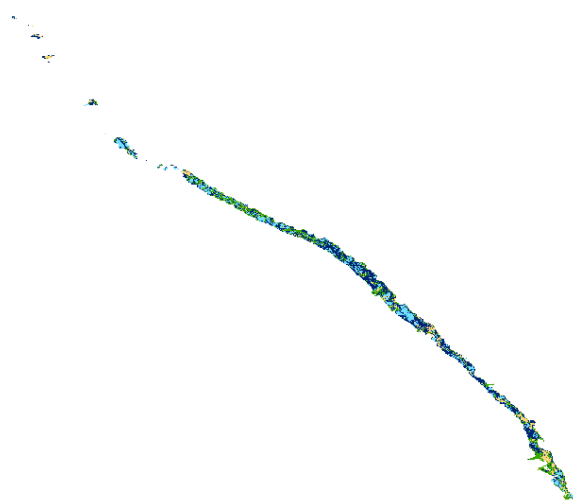
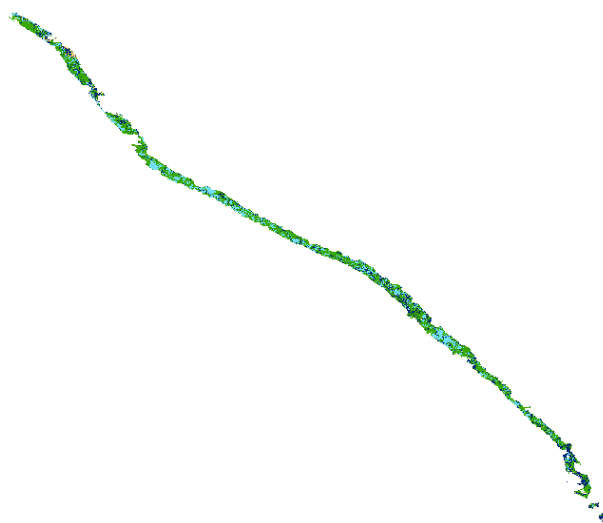

301

302

303

304 **Table S64.** Confusion Matrix with commission and omission errors from late-May to July 2020

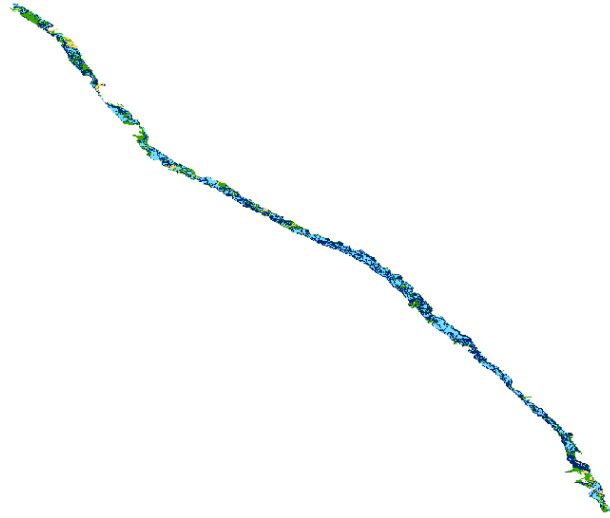
Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	90	1	9	0	100	0.10		
Marsh	8	85	7	0	100	0.15		
Wet meadow	5	5	86	4	100	0.14	87.0%	0.83
Woody/Shrub	0	4	9	87	100	0.13		
Marginal total	103	95	111	91	400			
Omission Error	0.13	0.11	0.23	0.04				

305

306

307

308 **Table S65.** Confusion Matrix with commission and omission errors from late-May to July 2021

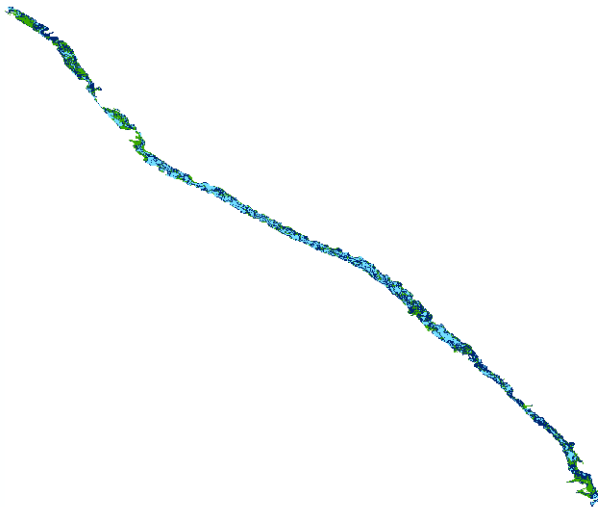
Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	92	4	4	0	100	0.08		
Marsh	8	86	6	0	100	0.14		
Wet meadow	1	6	89	4	100	0.11	88.8%	0.85
Woody/Shrub	0	5	7	88	100	0.12		
Marginal total	101	101	106	92	400			
Omission Error	0.09	0.15	0.16	0.04				

309

310

311

312   **Table S66.** Confusion Matrix with commission and omission errors from late-May to July 2022

Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	91	3	6	0	100	0.09		
Marsh	4	90	6	0	100	0.10		
Wet meadow	3	2	89	6	100	0.11	90.3%	0.87
Woody/Shrub	0	4	5	91	100	0.09		
Marginal total	98	99	106	97	400			
Omission Error	0.07	0.09	0.16	0.06				

313

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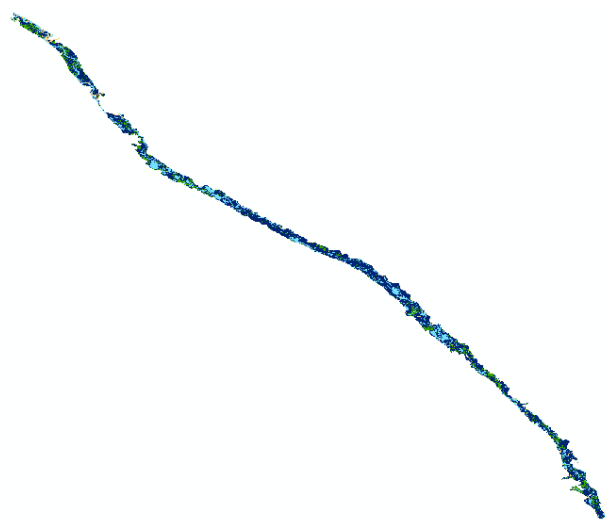
317   **2.3. Season: August to mid-September**

318

319   **Table S67.** Confusion Matrix with commission and omission errors from August to mid-September 1984

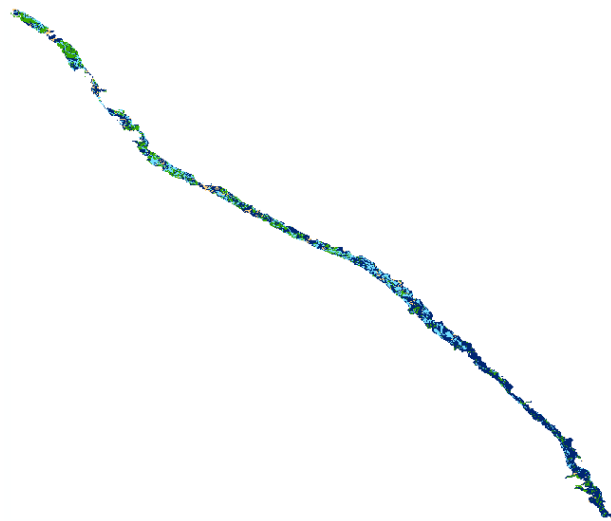
Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	84	10	6	0	100	0.16		
Marsh	0	82	12	6	100	0.18		
Wet meadow	0	12	80	8	100	0.20	81.8%	0.76
Woody/Shrub	0	7	12	81	100	0.19		
Marginal total	84	111	110	95	400			
Omission Error	0	0.26	0.27	0.15				

320

321

322

323   **Table S68.** Confusion Matrix with commission and omission errors from August to mid-September 1985

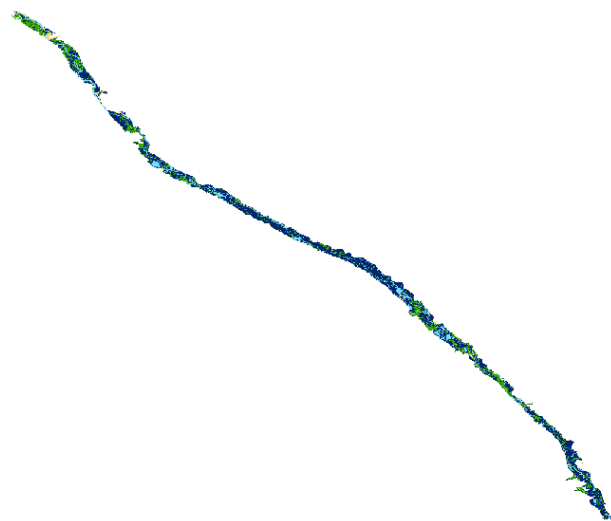
Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	85	9	6	0	100	0.15		
Marsh	0	84	10	6	100	0.16		
Wet meadow	0	11	85	4	100	0.15	84.5%	0.79
Woody/Shrub	0	6	10	84	100	0.16		
Marginal total	85	110	111	94	400			
Omission Error	0	0.236	0.23	0.11				

324

325

326

327   **Table S69.** Confusion Matrix with commission and omission errors from August to mid-September 1986

Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	86	3	5	0	94	0.09		
Marsh	0	85	12	3	100	0.15		
Wet meadow	0	11	84	5	100	0.16	86.3%	0.82
Woody/Shrub	0	4	11	85	100	0.15		
Marginal total	86	103	112	93	394			
Omission Error	0	0.175	0.25	0.09				

328

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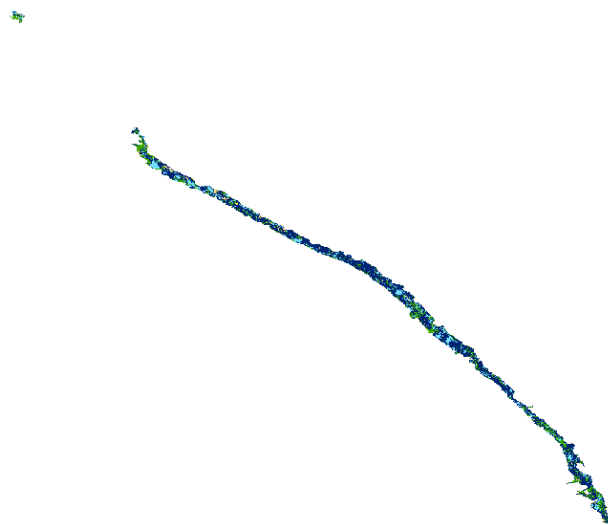
331

332 **Table S70.** Confusion Matrix with commission and omission errors from August to mid-September 1987

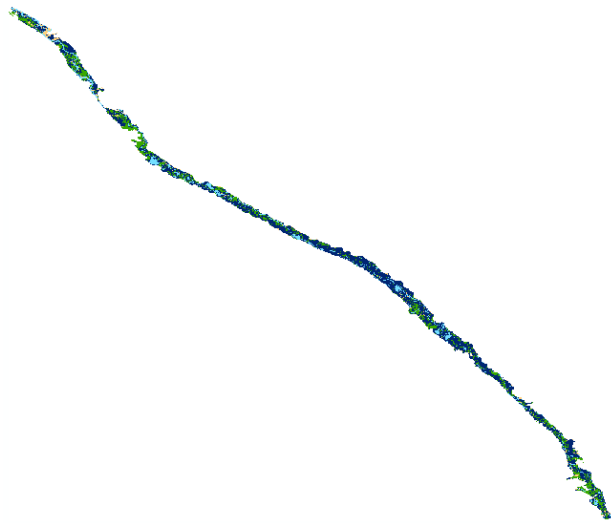
Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	87	9	4	0	100	0.13		
Marsh	6	84	10	0	100	0.16		
Wet meadow	0	12	83	5	100	0.17	85.0%	0.80
Woody/Shrub	0	8	6	86	100	0.14		
Marginal total	93	113	103	91	400			
Omission Error	0.06	0.26	0.19	0.05				

333

334

335

336 **Table S71.** Confusion Matrix with commission and omission errors from August to mid-September 1988

Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	86	8	4	0	98	0.12		
Marsh	0	80	15	5	100	0.20		
Wet meadow	0	6	83	11	100	0.17	82.7%	0.77
Woody/Shrub	0	12	8	80	100	0.20		
Marginal total	86	106	110	96	398			
Omission Error	0	0.25	0.25	0.17				

337

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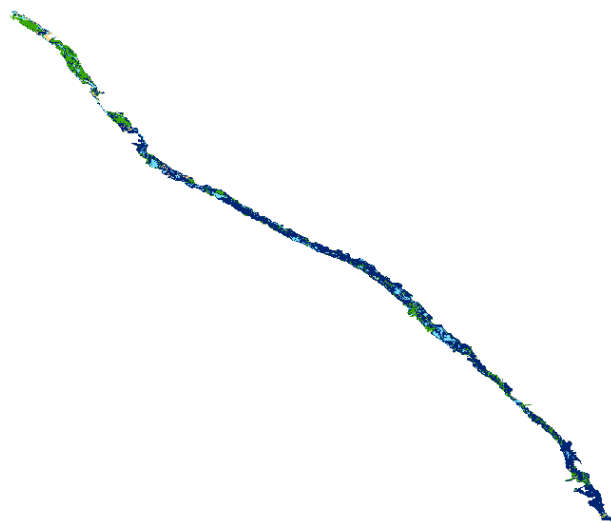
339

340   **Table S72.** Confusion Matrix with commission and omission errors from August to mid-September 1990

Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	80	12	8	0	100	0.20		
Marsh	6	79	5	10	100	0.21		
Wet meadow	4	11	77	8	100	0.23	79.3%	0.72
Woody/Shrub	0	10	9	81	100	0.19		
Marginal total	90	112	99	99	400			
Omission Error	0.11	0.29	0.22	0.18				

341

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345 **Table S73.** Confusion Matrix with commission and omission errors from August to mid-September 1991

Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	83	8	9	0	100	0.17		
Marsh	6	82	6	6	100	0.18		
Wet meadow	4	9	84	3	100	0.16	83.5%	0.78
Woody/Shrub	0	9	6	85	100	0.15		
Marginal total	93	108	105	94	400			
Omission Error	0.11	0.24	0.20	0.10				

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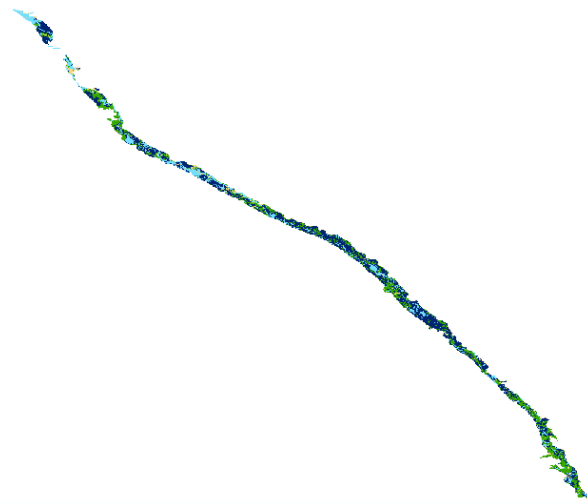
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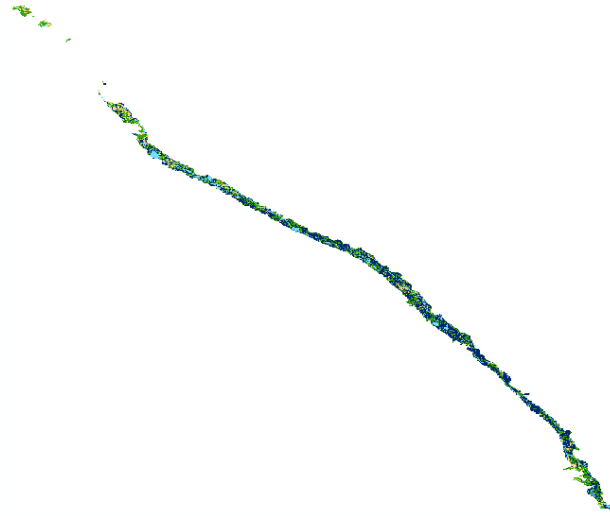
348

349 **Table S74.** Confusion Matrix with commission and omission errors from August to mid-September 1993

Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	54	2	4	0	60	0.10		
Marsh	1	54	0	5	60	0.10		
Wet meadow	0	4	55	1	60	0.08	90.4%	0.87
Woody/Shrub	0	1	5	54	60	0.10		
Marginal total	55	61	64	60	240			
Omission Error	0.02	0.11	0.14	0.10				

350

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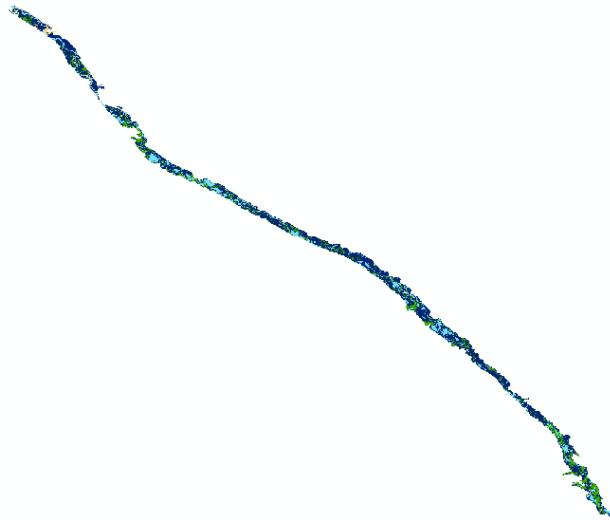
352

353   **Table S75.** Confusion Matrix with commission and omission errors from August to mid-September 1994

Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	56	1	3	0	60	0.07		
Marsh	1	54	0	5	60	0.10		
Wet meadow	0	3	53	4	60	0.12	90.0%	0.87
Woody/Shrub	0	4	3	53	60	0.12		
Marginal total	57	62	59	62	240			
Omission Error	0.02	0.13	0.10	0.15				

354

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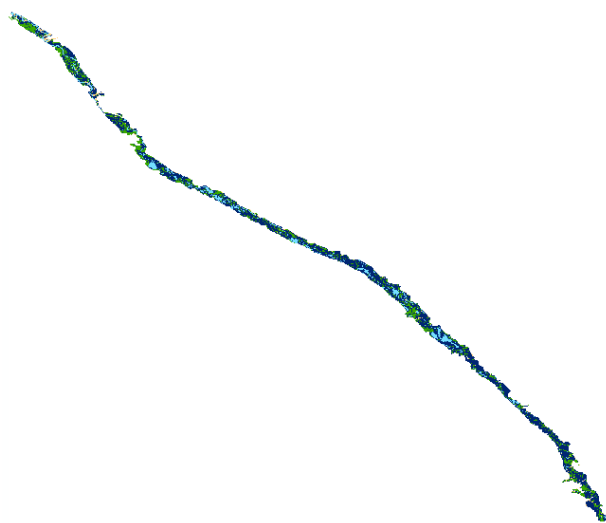
357

358   **Table S76.** Confusion Matrix with commission and omission errors from August to mid-September 1996

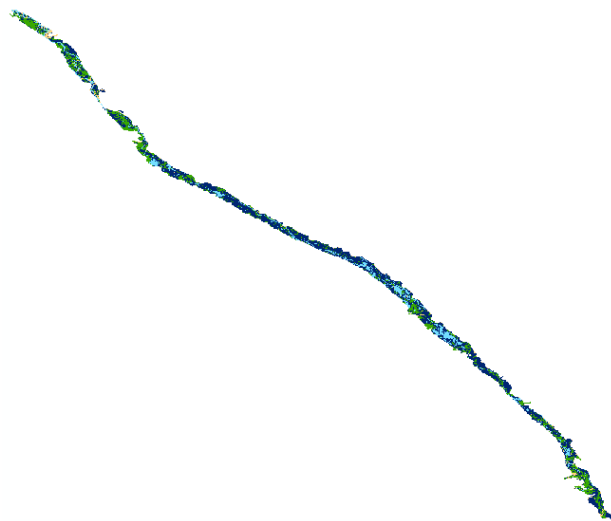
Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	50	5	5	0	60	0.17		
Marsh	1	53	0	6	60	0.12		
Wet meadow	0	4	53	3	60	0.12	86.3%	0.82
Woody/Shrub	0	4	5	51	60	0.15		
Marginal total	51	66	63	60	240			
Omission Error	0.02	0.20	0.16	0.15				

359

360

361

362   **Table S77.** Confusion Matrix with commission and omission errors from August to mid-September 1997

Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	56	1	3	0	60	0.07		
Marsh	1	55	0	4	60	0.08		
Wet meadow	0	3	53	4	60	0.12	90.4%	0.87
Woody/Shrub	0	4	3	53	60	0.12		
Marginal total	57	63	59	61	240			
Omission Error	0.02	0.13	0.10	0.13				

363

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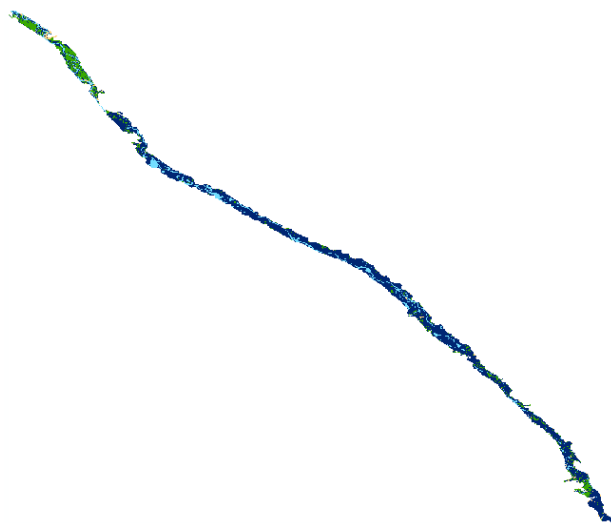
365

366   **Table S78.** Confusion Matrix with commission and omission errors from August to mid-September 1998

Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	53	2	5	0	60	0.12		
Marsh	1	54	0	5	60	0.10		
Wet meadow	0	4	55	1	60	0.08	88.8%	0.85
Woody/Shrub	0	4	5	51	60	0.15		
Marginal total	54	64	65	57	240			
Omission Error	0.02	0.16	0.15	0.11				

367

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371 **Table S79.** Confusion Matrix with commission and omission errors from August to mid-September 2000

Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	53	3	4	0	60	0.12		
Marsh	1	56	0	3	60	0.07		
Wet meadow	0	4	52	4	60	0.13	87.9%	0.84
Woody/Shrub	0	4	6	50	60	0.17		
Marginal total	54	67	62	57	240			
Omission Error	0.02	0.16	0.16	0.12				

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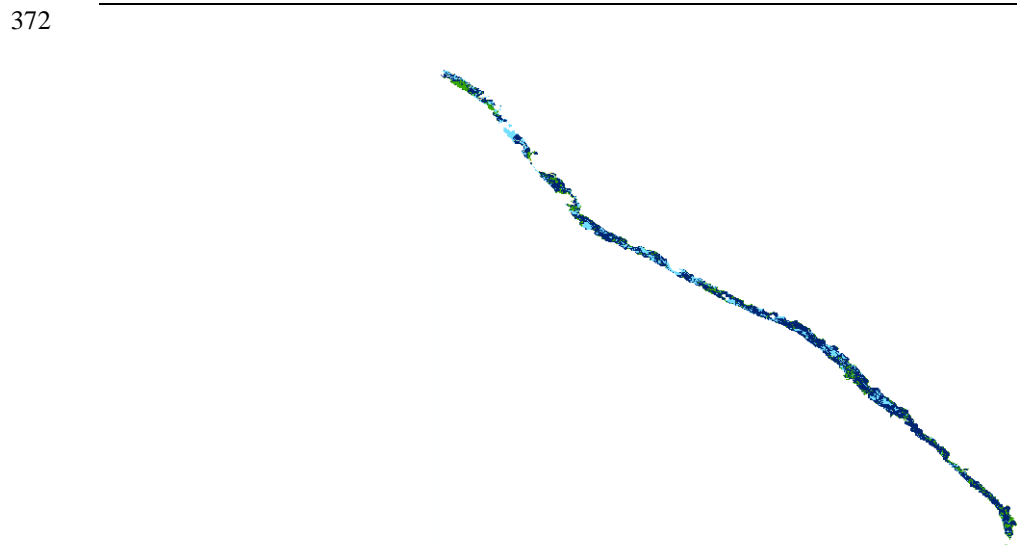
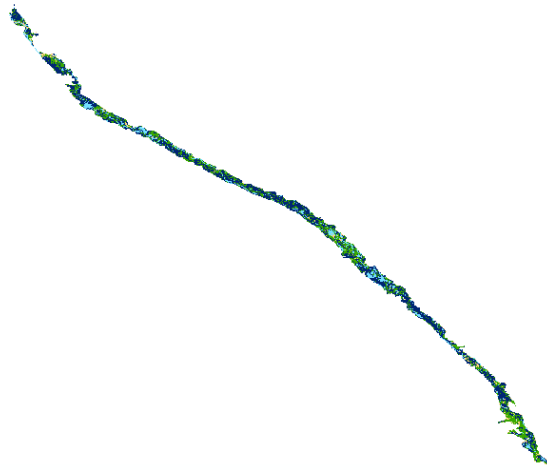
374

375 **Table S80.** Confusion Matrix with commission and omission errors from August to mid-September 2001

Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	52	7	1	0	60	0.13		
Marsh	1	55	1	3	60	0.08		
Wet meadow	0	4	50	6	60	0.17	86.3%	0.82
Woody/Shrub	1	4	5	50	60	0.17		
Marginal total	54	70	57	59	240			
Omission Error	0.04	0.21	0.12	0.15				

376

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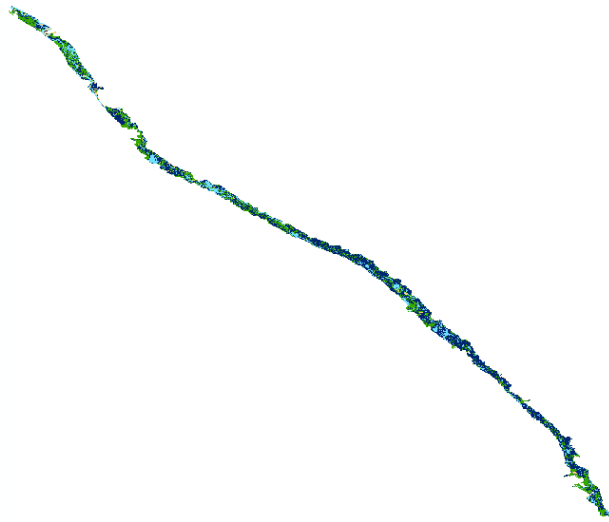
378

379   **Table S81.** Confusion Matrix with commission and omission errors from August to mid-September 2002

Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	53	3	4	0	60	0.12		
Marsh	1	53	1	5	60	0.12		
Wet meadow	0	4	55	1	60	0.08	90.0%	0.87
Woody/Shrub	0	4	1	55	60	0.08		
Marginal total	54	64	61	61	240			
Omission Error	0.02	0.17	0.10	0.10				

380

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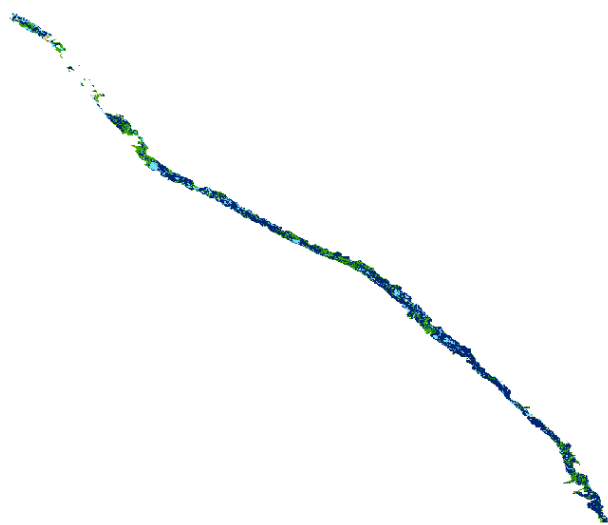
384 **Table S82.** Confusion Matrix with commission and omission errors from August to mid-September 2003

Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	57	1	2	0	60	0.05		
Marsh	0	54	0	6	60	0.10		
Wet meadow	0	5	50	5	60	0.17	88.3%	0.84
Woody/Shrub	0	4	5	51	60	0.15		
Marginal total	57	64	57	62	240			
Omission Error	0.00	0.16	0.12	0.18				

385

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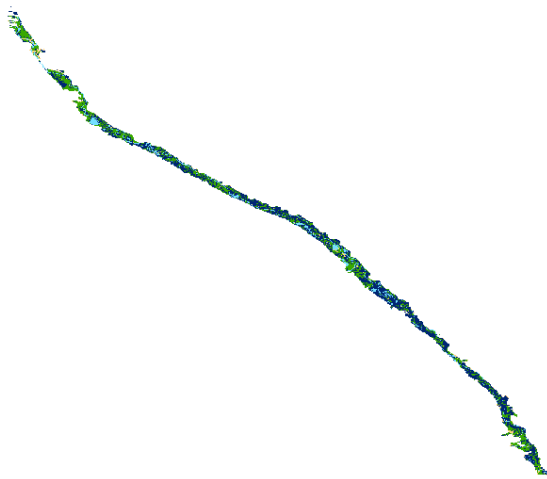
387

388 **Table S83.** Confusion Matrix with commission and omission errors from August to mid-September 2004

Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	54	5	1	0	60	0.10		
Marsh	1	53	0	6	60	0.12		
Wet meadow	0	4	52	4	60	0.13	88.8%	0.85
Woody/Shrub	0	4	2	54	60	0.10		
Marginal total	55	66	55	64	240			
Omission Error	0.02	0.20	0.05	0.16				

389

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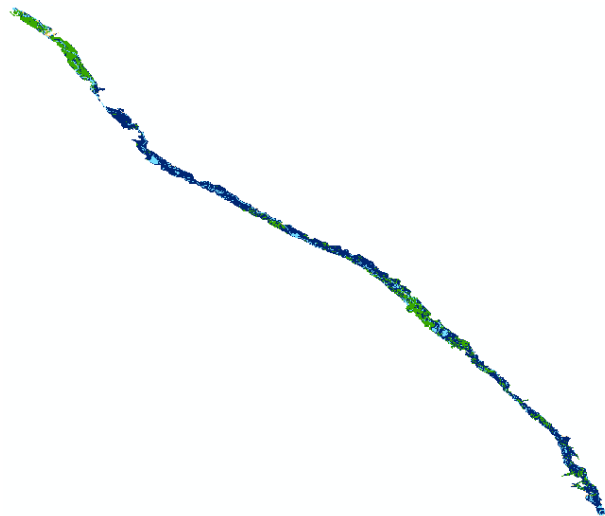
392 **Table S84.** Confusion Matrix with commission and omission errors from August to mid-September 2005

Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	81	11	8	0	100	0.19		
Marsh	9	82	9	0	100	0.18		
Wet meadow	4	8	82	6	100	0.18	82.3%	0.76
Woody/Shrub	0	10	6	84	100	0.16		
Marginal total	94	111	105	90	400			
Omission Error	0.14	0.26	0.22	0.07				

393

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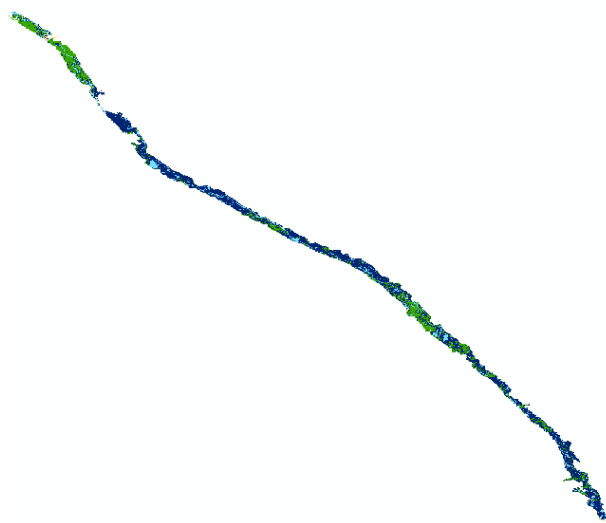
397 **Table S85.** Confusion Matrix with commission and omission errors from August to mid-September 2006

Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	54	4	2	0	60	0.10		
Marsh	1	54	0	5	60	0.10		
Wet meadow	0	2	54	4	60	0.10	90.4%	0.87
Woody/Shrub	0	4	1	55	60	0.08		
Marginal total	55	64	57	64	240			
Omission Error	0.02	0.16	0.05	0.14				

398

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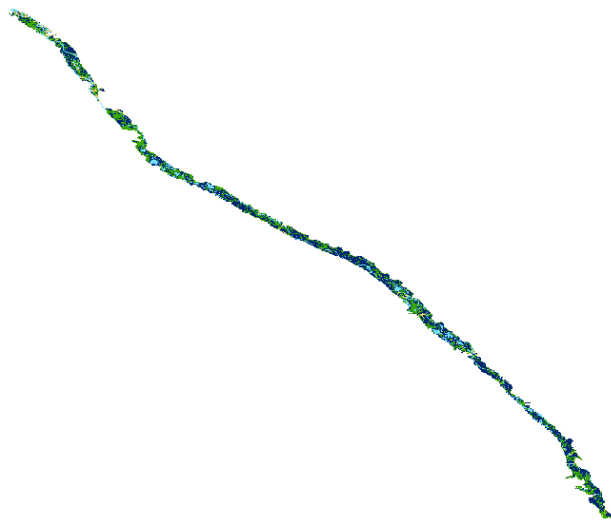
400

401 **Table S86.** Confusion Matrix with commission and omission errors from August to mid-September 2007

Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	84	10	6	0	100	0.16		
Marsh	4	83	4	9	100	0.17		
Wet meadow	1	8	85	6	100	0.15	83.5%	0.78
Woody/Shrub	0	10	8	82	100	0.18		
Marginal total	89	111	103	97	400			
Omission Error	0.06	0.25	0.17	0.15				

402

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404

405 **Table S87.** Confusion Matrix with commission and omission errors from August to mid-September 2008

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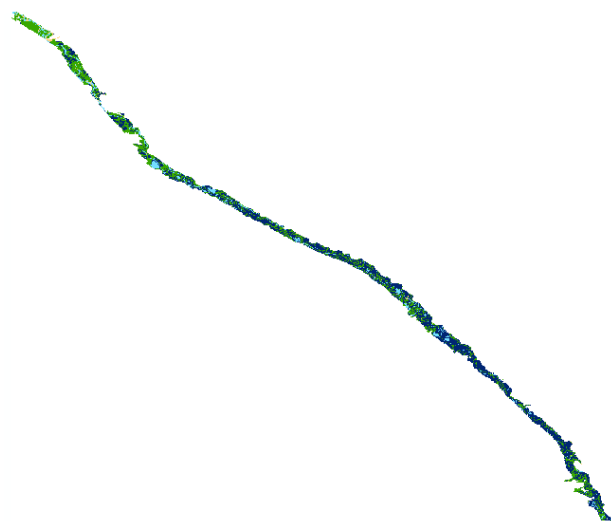
Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	53	3	4	0	60	0.12		
Marsh	1	54	0	5	60	0.10		
Wet meadow	0	5	53	2	60	0.12	88.8%	0.85
Woody/Shrub	0	6	1	53	60	0.12		
Marginal total	54	68	58	60	240			
Omission Error	0.02	0.21	0.09	0.12				

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409

410 **Table S88.** Confusion Matrix with commission and omission errors from August to mid-September 2009

Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	86	5	9	0	100	0.14		
Marsh	2	81	11	6	100	0.19		
Wet meadow	4	6	80	10	100	0.20	82.8%	0.77
Woody/Shrub	0	4	12	84	100	0.16		
Marginal total	92	96	112	100	400			
Omission Error	0.07	0.16	0.29	0.16				

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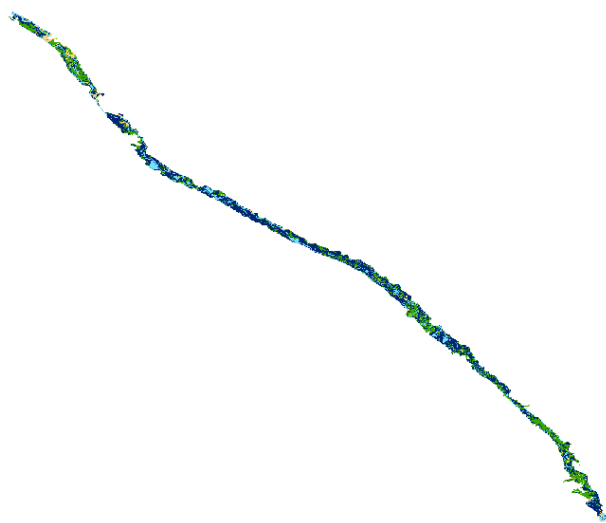
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413

414 **Table S89.** Confusion Matrix with commission and omission errors from August to mid-September 2010

Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	56	2	2	0	60	0.07		
Marsh	1	55	0	4	60	0.08		
Wet meadow	0	4	52	4	60	0.13	89.6%	0.86
Woody/Shrub	0	4	4	52	60	0.13		
Marginal total	57	65	58	60	240			
Omission Error	0.02	0.15	0.10	0.13				

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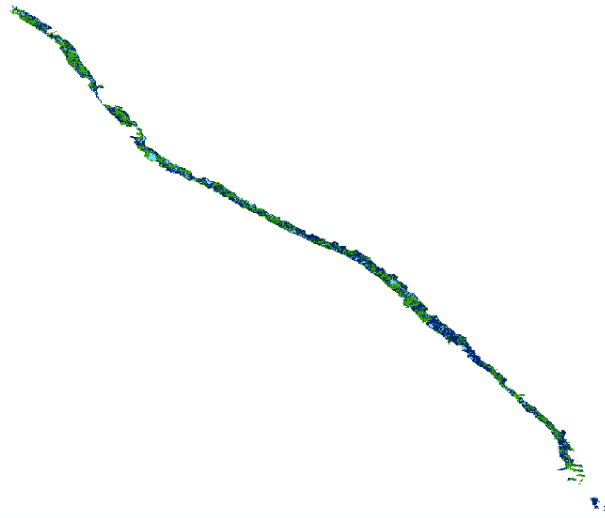
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418   **Table S90.** Confusion Matrix with commission and omission errors from August to mid-September 2011

Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	53	3	4	0	60	0.12		
Marsh	1	53	0	6	60	0.12		
Wet meadow	0	4	52	4	60	0.13	87.9%	0.84
Woody/Shrub	0	4	3	53	60	0.12		
Marginal total	54	64	59	63	240			
Omission Error	0.02	0.17	0.12	0.16				

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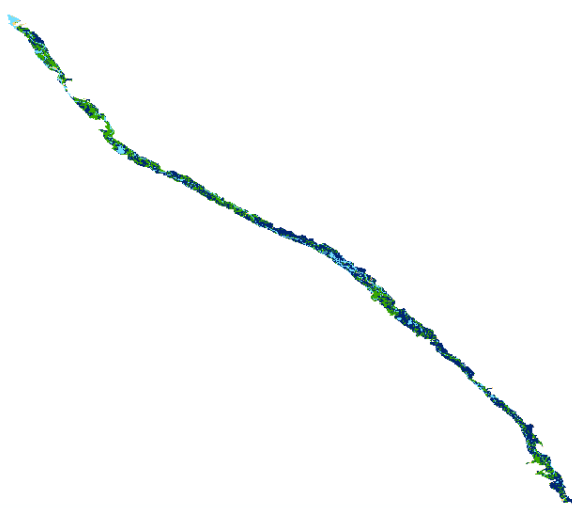
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423 **Table S91.** Confusion Matrix with commission and omission errors from August to mid-September 2013

Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	52	5	3	0	60	0.13		
Marsh	1	55	1	3	60	0.08		
Wet meadow	0	4	50	6	60	0.17	88.8%	0.85
Woody/Shrub	0	3	1	56	60	0.07		
Marginal total	53	67	55	65	240			
Omission Error	0.02	0.18	0.09	0.14				

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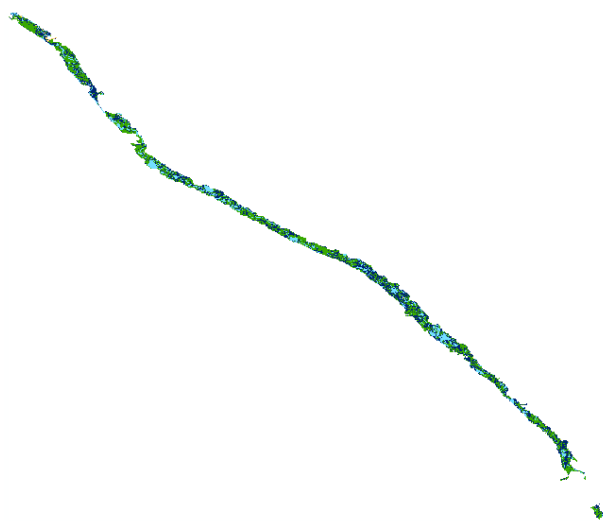
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427 **Table S92.** Confusion Matrix with commission and omission errors from August to mid-September 2014

Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	54	5	1	0	60	0.10		
Marsh	1	54	0	5	60	0.10		
Wet meadow	0	3	53	4	60	0.12	88.8%	0.85
Woody/Shrub	0	3	5	52	60	0.13		
Marginal total	55	65	59	61	240			
Omission Error	0.02	0.17	0.10	0.15				

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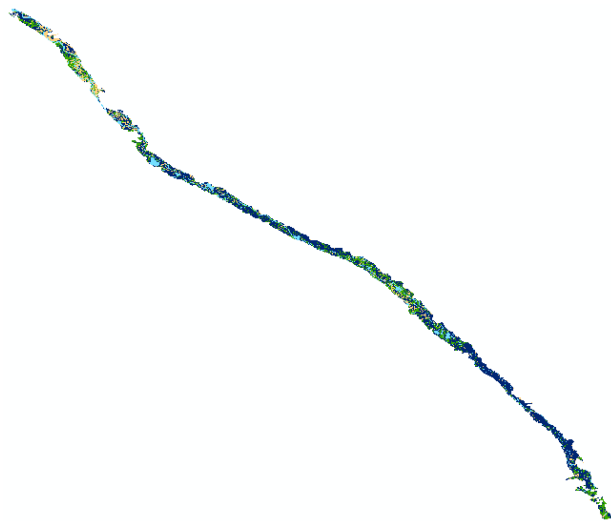
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431 **Table S93.** Confusion Matrix with commission and omission errors from August to mid-September 2015

Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	52	4	4	0	60	0.13		
Marsh	2	53	0	5	60	0.12		
Wet meadow	0	3	51	6	60	0.15	86.3%	0.82
Woody/Shrub	0	4	5	51	60	0.15		
Marginal total	54	64	60	62	240			
Omission Error	0.04	0.17	0.15	0.18				

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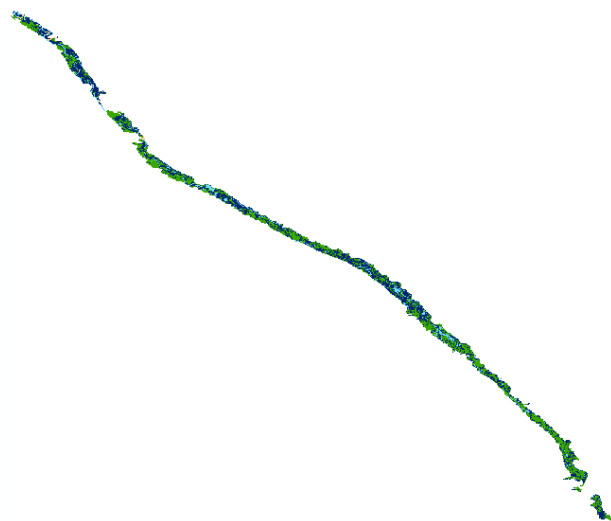
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436 **Table S94.** Confusion Matrix with commission and omission errors from August to mid-September 2016

Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	80	9	11	0	100	0.20		
Marsh	8	82	10	0	100	0.18		
Wet meadow	4	8	81	7	100	0.19	80.5%	0.74
Woody/Shrub	0	9	12	79	100	0.21		
Marginal total	92	108	114	86	400			
Omission Error	0.13	0.24	0.29	0.08				

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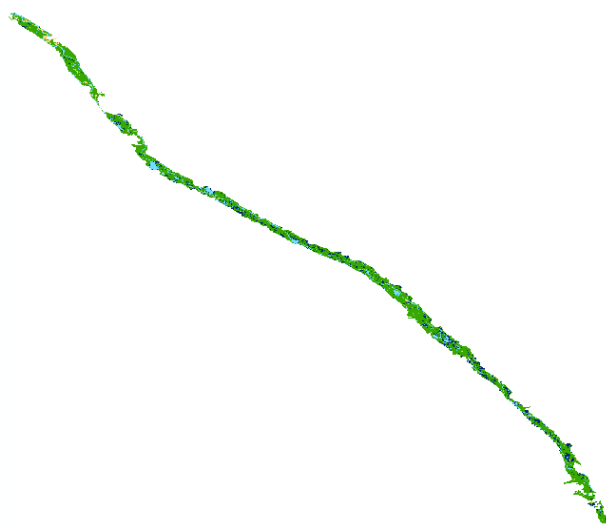
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440 **Table S95.** Confusion Matrix with commission and omission errors from August to mid-September 2017

Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	83	10	7	0	100	0.17		
Marsh	5	81	14	0	100	0.19		
Wet meadow	5	7	85	3	100	0.15	83.8%	0.78
Woody/Shrub	0	4	10	86	100	0.14		
Marginal total	93	102	116	89	400			
Omission Error	0.11	0.21	0.27	0.03				

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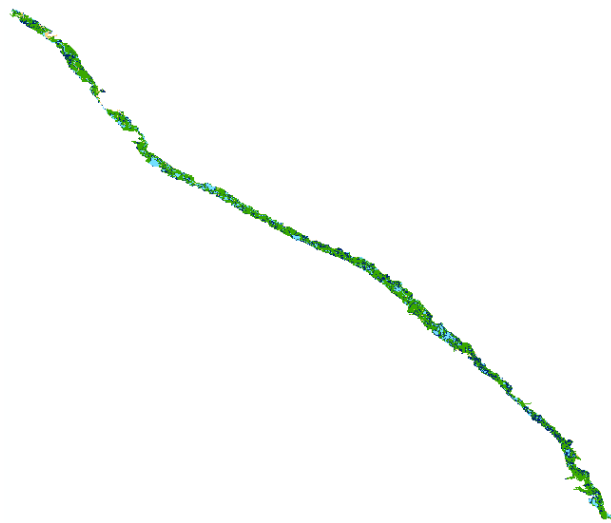
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444   **Table S96.** Confusion Matrix with commission and omission errors from August to mid-September 2018

Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	81	5	14	0	100	0.19		
Marsh	5	83	10	2	100	0.17		
Wet meadow	5	7	85	3	100	0.15	83.3%	0.78
Woody/Shrub	0	5	11	84	100	0.16		
Marginal total	91	100	120	89	400			
Omission Error	0.11	0.17	0.29	0.06				

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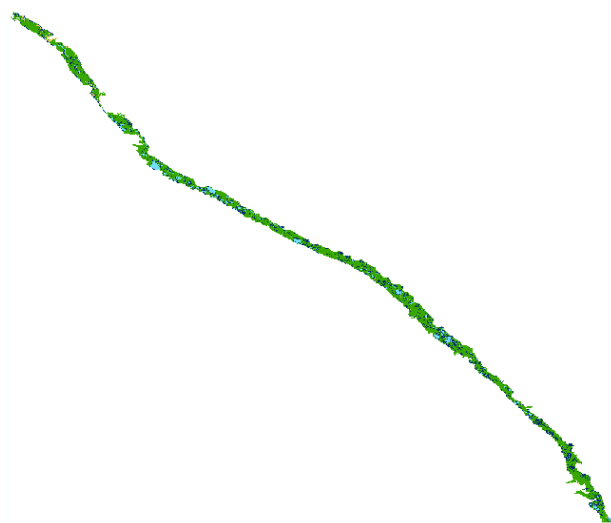
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449 **Table S97.** Confusion Matrix with commission and omission errors from August to mid-September 2019

Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	80	9	11	0	100	0.20		
Marsh	4	81	10	5	100	0.19		
Wet meadow	6	7	81	6	100	0.19	81.5%	0.75
Woody/Shrub	0	8	8	84	100	0.16		
Marginal total	90	105	110	95	400			
Omission Error	0.11	0.23	0.26	0.12				

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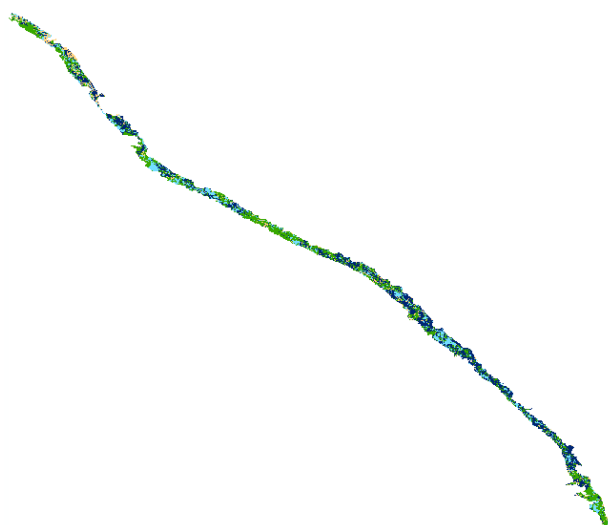
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453 **Table S98.** Confusion Matrix with commission and omission errors from August to mid-September 2020

Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	84	7	9	0	100	0.16		
Marsh	6	85	9	0	100	0.15		
Wet meadow	5	8	85	2	100	0.15	85.0%	0.80
Woody/Shrub	0	7	7	86	100	0.14		
Marginal total	95	107	110	88	400			
Omission Error	0.12	0.21	0.23	0.02				

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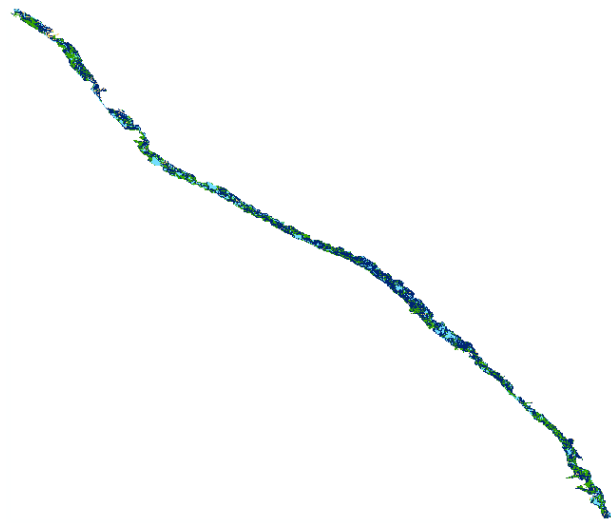
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457   **Table S99.** Confusion Matrix with commission and omission errors from August to mid-September 2021

Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	81	9	10	0	100	0.19		
Marsh	6	82	12	0	100	0.18		
Wet meadow	3	5	84	8	100	0.16	82.0%	0.76
Woody/Shrub	0	9	10	81	100	0.19		
Marginal total	90	105	116	89	400			
Omission Error	0.10	0.22	0.28	0.09				

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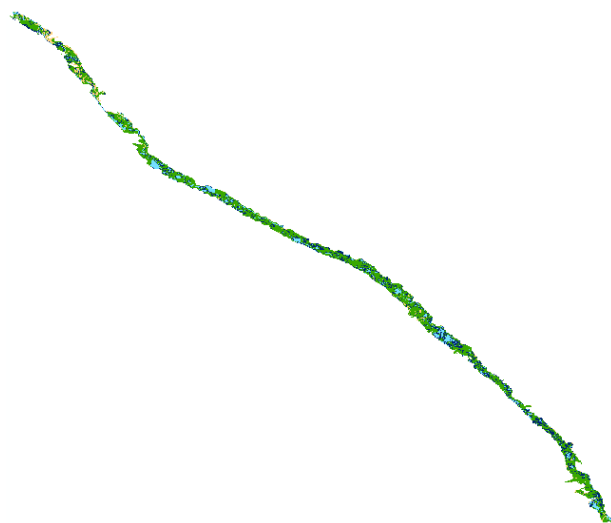
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462   **Table S100.** Confusion Matrix with commission and omission errors from August to mid-September 2022

Classes	Water	Marsh	Wet meadow	Woody/Shrub	Marginal total	Comission Error	Total Accuracy	Kappa Index
Water	81	9	10	0	100	0.19		
Marsh	8	82	10	0	100	0.18		
Wet meadow	3	5	84	8	100	0.16	82.0%	0.76
Woody/Shrub	0	3	16	81	100	0.19		
Marginal total	92	99	120	89	400			
Omission Error	0.12	0.17	0.30	0.09				

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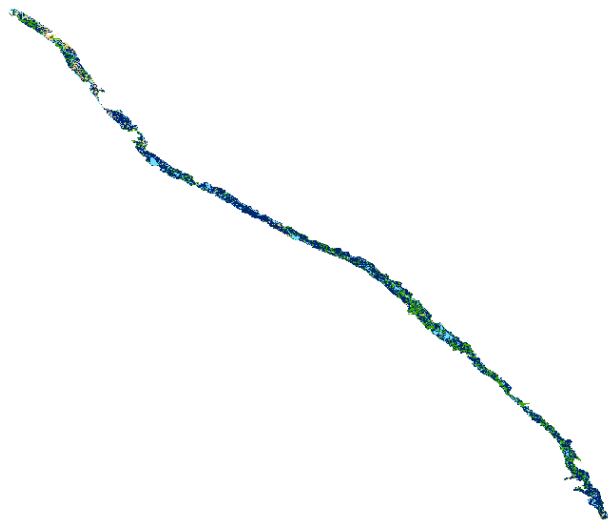
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475 **3.** *Location and type of change*

476 **Table S101.** Main land use changed locations in 39 years (1984 - 2022) between Invermere and Brisco.

| Variable | Invermere to Brisco | | |
	Latitude	Longitude	Type of Change
April to mid-May	-116.070038	50.584393	Marsh -> Woody
	-116.095173	50.603175	Increasing Woody
	-116.04308	50.528733	Marsh -> Woody
	-116.177899	50.736033	Increasing Woody
	-116.239655	50.78855	Marsh -> Wet meadow
	-116.125143	50.670709	Marsh -> Wet meadow
	-116.174606	50.713339	Marsh -> Woody
	-116.081219	50.574385	Increasing Woody
	-116.277338	50.811556	Marsh -> Wet meadow
	-116.162224	50.703786	Marsh -> Wet meadow
Peak flow	-116.038112	50.526231	Marsh -> Woody
	-116.093436	50.606662	Marsh -> Woody
	-116.090273	50.63334	Marsh -> Woody
	-116.11979	50.670035	Marsh -> Open Water
	-116.14746	50.698404	Open Water -> Marsh
	-116.198786	50.738707	Marsh -> Woody
	-116.19326	50.738995	Marsh -> Wet meadow
	-116.221557	50.765768	Open Water -> Wet meadow
	-116.24932	50.788413	Open Water -> Wet meadow
	-116.27364	50.812031	Marsh -> Wet meadow
August to mid-September	-116.038535	50.521344	Open Water -> Wet meadow
	-116.064085	50.550234	Increasing Woody
	-116.092762	50.60131	Increasing Woody
	-116.104538	50.633638	Increasing Woody
	-116.130242	50.67333	Marsh -> Woody
	-116.171825	50.710084	Marsh -> Woody
	-116.217978	50.759342	Open Water -> Marsh
	-116.237113	50.781734	Marsh -> Woody
	-116.25554	50.794001	Marsh -> Woody
	-116.290514	50.822827	Open Water -> Marsh

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481 **Table S102.** Main land use changed locations in 39 years (1984 - 2022) between Brisco and Spillimacheen.

Variable	Brisco - Spillimacheen		
	Latitude	Longitude	Type of Change
April to mid-May	-116.296517	50.840185	Marsh -> Wet meadow
	-116.359798	50.877271	Marsh -> Woody
	-116.322492	50.848615	Open Water -> Wet meadow
	-116.334955	50.860212	Open Water -> Marsh
	-116.319927	50.837705	Marsh -> Woody
	-116.350209	50.874409	Marsh -> Open Water
	-116.344624	50.885097	Marsh -> Open Water
	-116.371156	50.882477	Marsh -> Wet meadow
	-116.296917	50.846019	Marsh -> Wet meadow
	-116.319993	50.860906	Open Water -> Wet meadow
Peak flow	-116.289817	50.830419	Marsh -> Wet meadow
	-116.297046	50.830983	Marsh -> Woody
	-116.294508	50.838653	Marsh -> Wet meadow
	-116.320395	50.83832	Increasing Woody
	-116.313122	50.847201	Increase Open Water
	-116.324668	50.86354	Increasing Woody
	-116.327038	50.855792	Increasing Open Water
	-116.355121	50.877561	Open Water -> Marsh
	-116.368778	50.886045	Open Water -> Marsh
	-116.370496	50.881495	Increasing of Woody
August to mid-September	-116.29541	50.834518	Increase of Woody
	-116.293753	50.837741	Marsh -> Wet meadow
	-116.293775	50.842699	Marsh -> Wet meadow
	-116.31053	50.846637	Open water -> Wet meadow
	-116.305856	50.840886	Open water -> Wet meadow
	-116.333778	50.860109	Marsh -> Open water
	-116.32318	50.853831	Marsh -> Woody
	-116.35226	50.86656	Open Water -> Marsh
	-116.325442	50.864001	Increasing Woody
	-116.376093	50.886876	Reduction Open Water

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Table S103. Main land use changed locations in 39 years (1984 - 2022) between Spillimacheen and Golden

| Variable | Spillimacheen - Golden | | |
	Latitude	Longitude	Type of Change
April to mid-May	-116.381517	50.904509	Open Water -> Wet meadow
	-116.426604	50.947291	Open Water -> Wet meadow
	-116.507493	51.003967	Marsh -> Woody
	-116.607194	51.047293	Reduction Open Water
	-116.680141	51.080912	Open Water -> Wet meadow
	-116.729989	51.113138	Reduction Open Water
	-116.753706	51.123268	Marsh -> Woody
	-116.786234	51.140634	Open Water -> Wet meadow
	-116.839237	51.158389	Marsh -> Wet meadow
	-116.962987	51.275513	Reduction Open Water
Peak flow	-116.381174	50.904655	Reduction Open Water
	-116.382784	50.921354	Open Water -> Marsh
	-116.432436	50.942758	Marsh -> Open Water
	-116.5587	51.030912	Marsh -> Woody
	-116.631734	51.055287	Marsh -> Woody
	-116.704028	51.091648	Open Water -> Wet meadow
	-116.807933	51.150807	Increasing of Woody
	-116.832644	51.157964	Marsh -> Wet meadow
	-116.903095	51.223405	Increasing Woody
	-116.931728	51.264756	Open Water -> Marsh
August to mid-September	-116.368994	50.900224	Marsh -> Woody
	-116.400081	50.915843	Increasing Woody
	-116.437284	50.958089	Increasing Woody
	-116.474132	50.989651	Open Water -> Wet meadow
	-116.560292	51.029483	Increasing Woody
	-116.613644	51.054003	Marsh -> Woody
	-116.676204	51.080471	Open Water -> Wet meadow
	-116.821183	51.152432	Marsh -> Woody
	-116.865949	51.184354	Increasing Woody
	-116.933324	51.263125	Open Water -> Marsh

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499   **Table S104.** Main land use changed locations in 39 years (1984 - 2022) between Golden and Donald

Variable	Golden - Donald		
	Latitude	Longitude	Type of Change
April to mid-May	-116.992146	51.320568	Increasing Woody
	-117.01136	51.345238	Open Water -> Wet meadow
	-117.014935	51.360769	Increasing Woody
	-117.055091	51.402087	Marsh -> Woody
	-117.040339	51.397867	Open Water -> Marsh
	-117.073468	51.424158	Increasing Woody
	-117.083538	51.435288	Open Water -> Wet meadow
	-117.10259	51.450278	Open Water -> Wet meadow
	-117.113668	51.456344	Open Water -> Wet meadow
	-117.125409	51.448876	Open Water -> Wet meadow
Peak flow	-116.981377	51.32178	Marsh -> Wet meadow
	-116.995945	51.326782	Marsh -> Open Water
	-117.006986	51.348752	Increasing Woody
	-117.015061	51.348185	Marsh -> Woody
	-117.016769	51.361068	Open Water -> Marsh
	-117.047576	51.387613	Open Water -> Marsh
	-117.084054	51.429086	Increasing Woody
	-117.102849	51.436973	Open Water -> Wet meadow
	-117.088435	51.436425	Open Water -> Wet meadow
	-117.117431	51.448929	Increasing Woody
August to mid-September	-116.992433	51.321521	Increasing Woody
	-117.000772	51.338861	Open Water -> Wet meadow
	-117.040707	51.397238	Marsh -> Wet meadow
	-117.067665	51.415269	Open Water -> Marsh
	-117.090323	51.43747	Open Water -> Wet meadow
	-117.112821	51.455289	Open Water -> Wet meadow
	-117.146128	51.46369	Increasing Woody
	-117.12988	51.455909	Increasing Woody
	-117.093061	51.441884	Increasing Woody
	-117.087133	51.426688	Increasing Woody

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