

Supplementary material

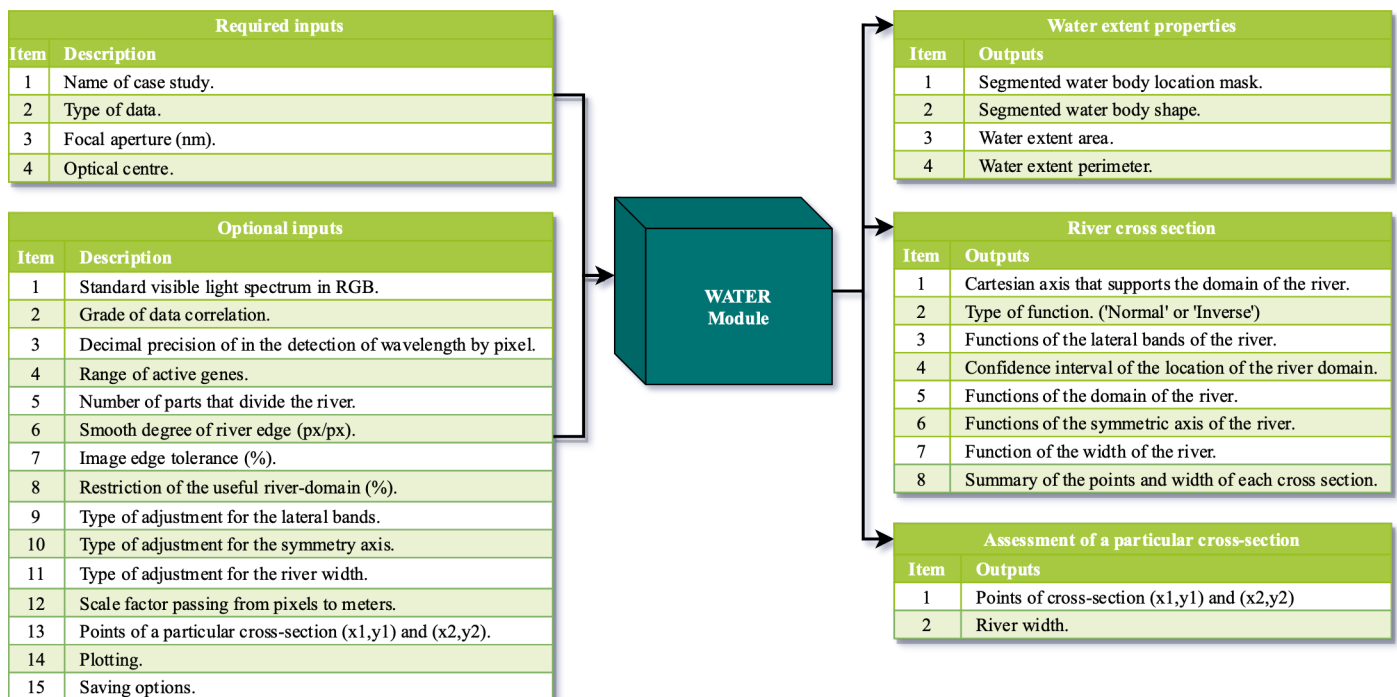
Automatic Segmentation of Water Bodies Using RGB Data: A Physically-Based approach

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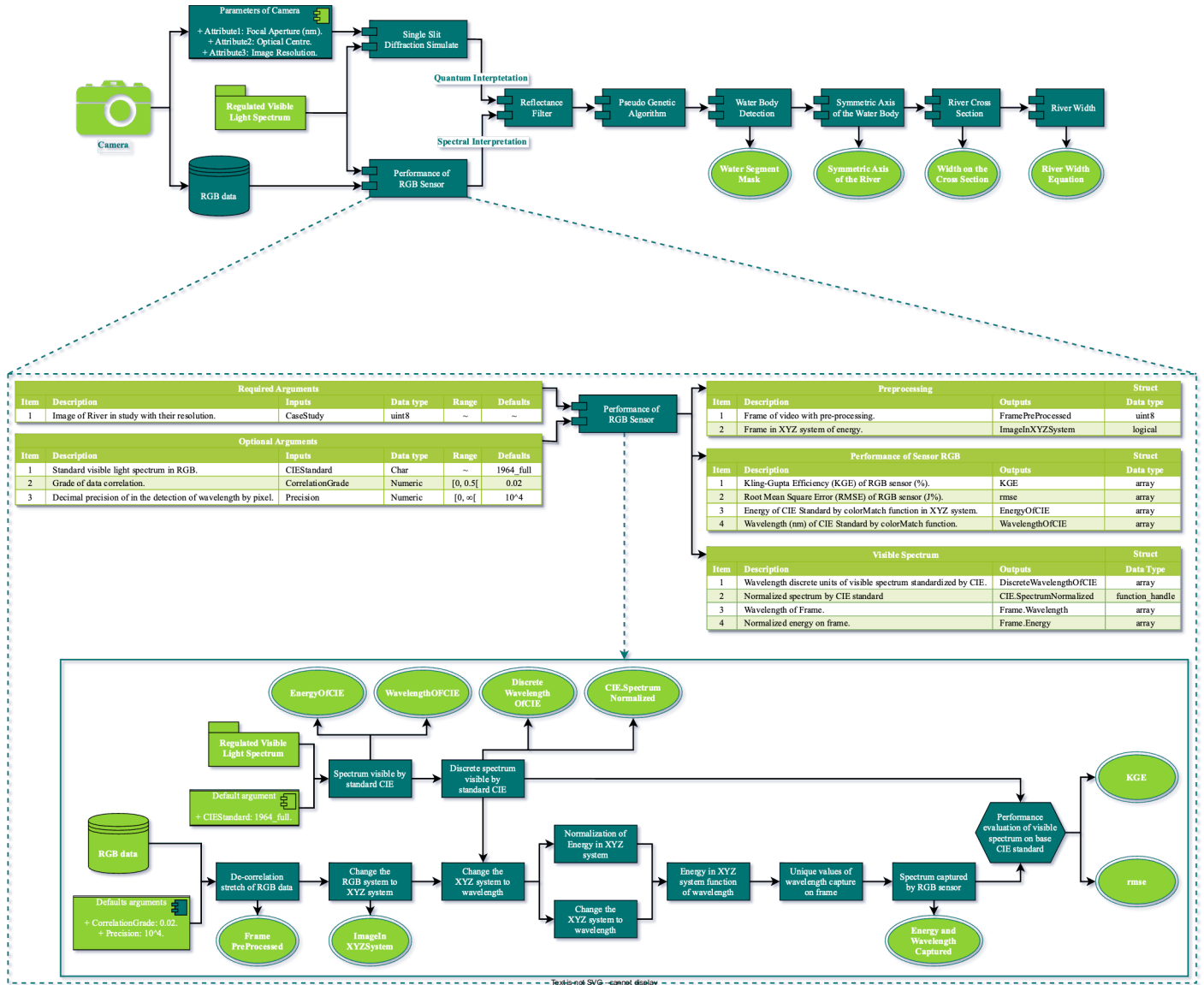
* Correspondence: alonso.pizarro@mail.udp.cl

Supplementary Material A – WATER modelling overview with required and optional inputs as well outputs.

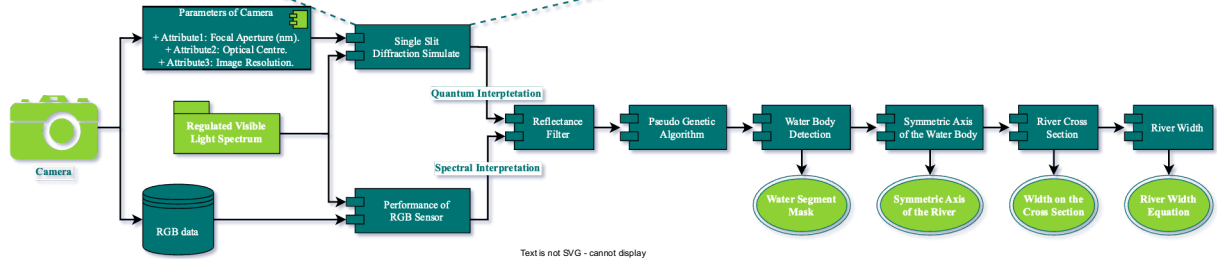
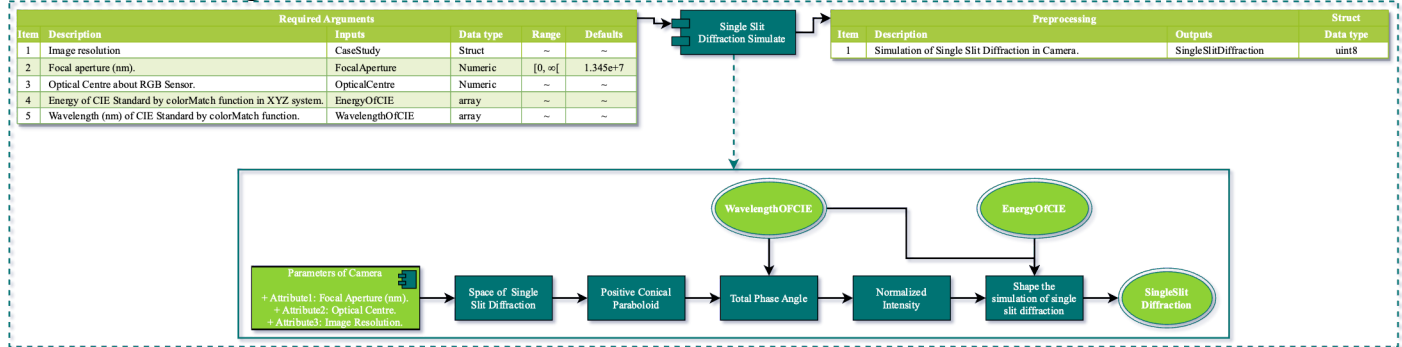


Supplementary Material B – WATER modelling framework

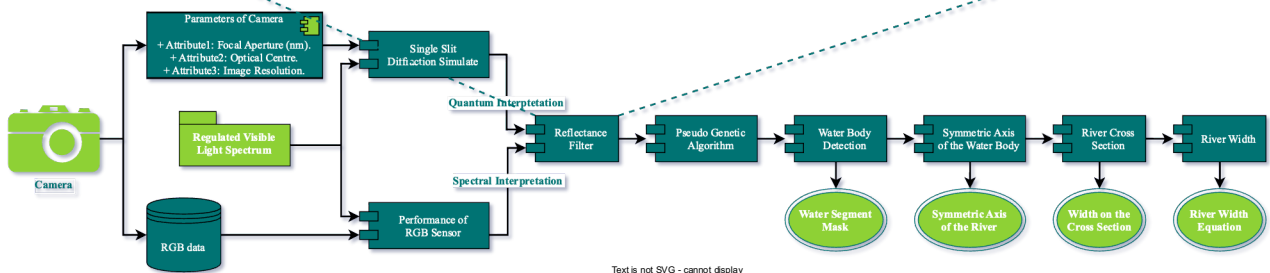
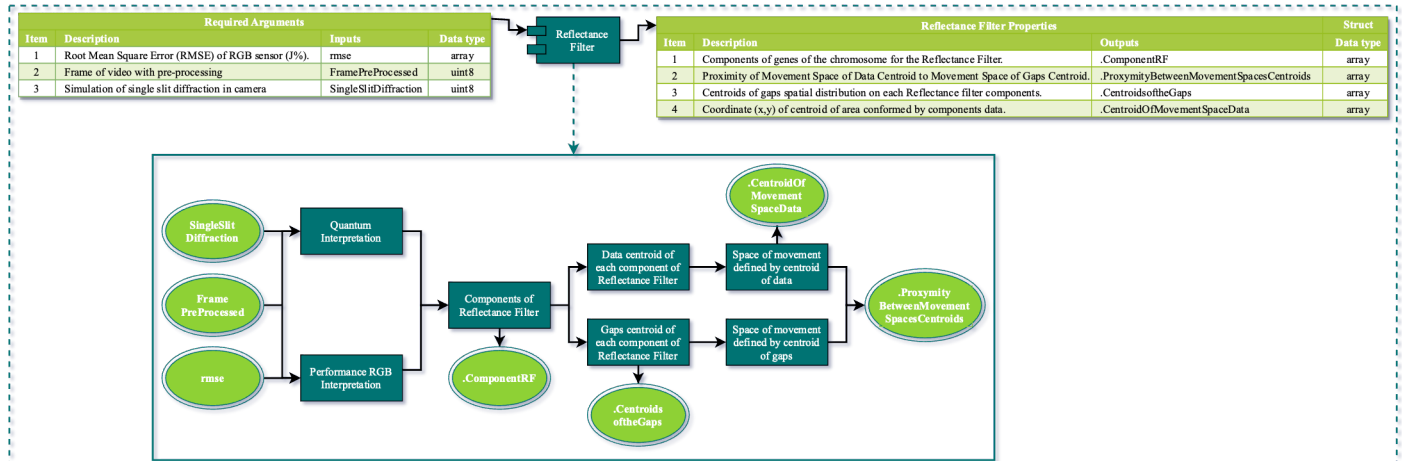
Performance of RGB sensor:



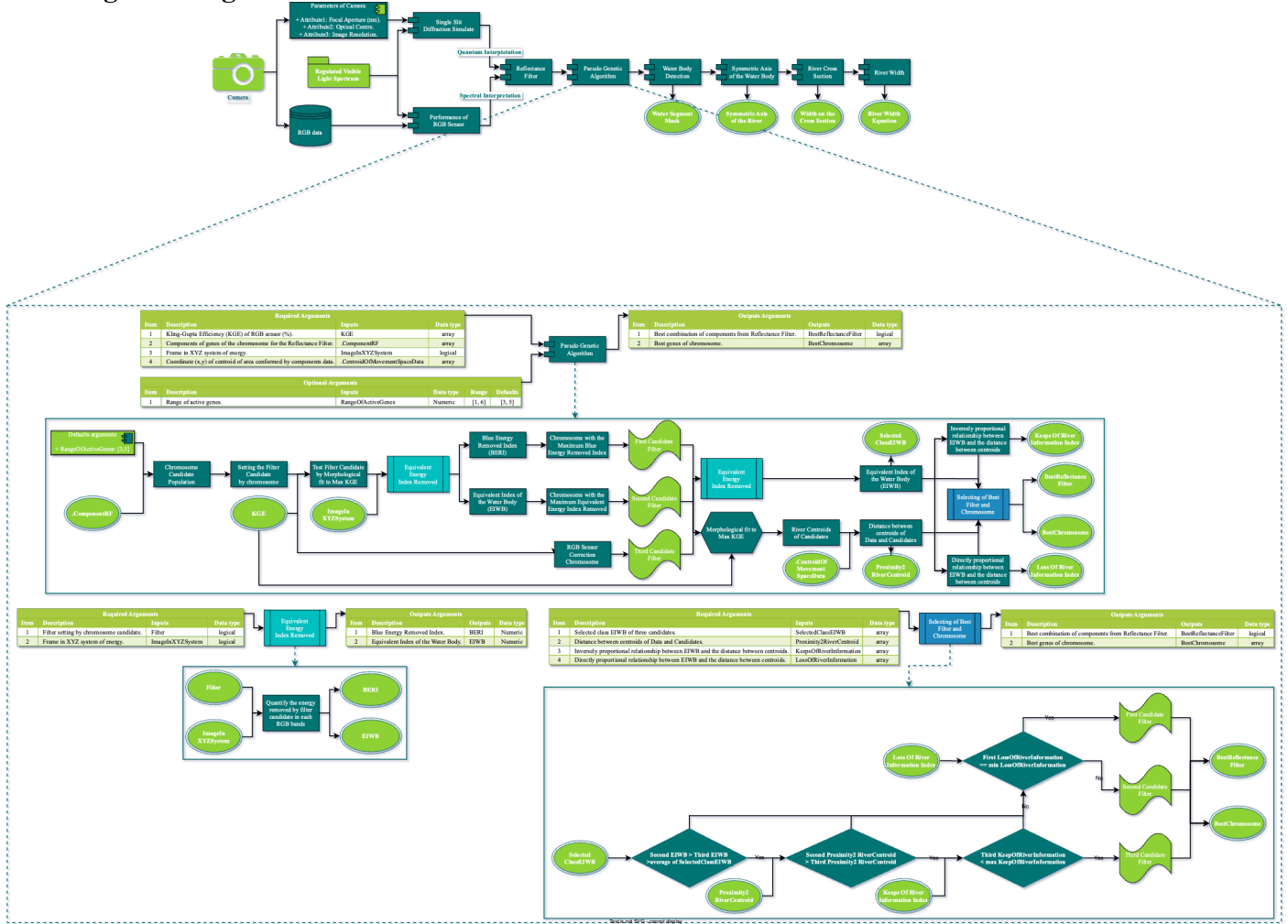
Simulation of Single Slit Diffraction:



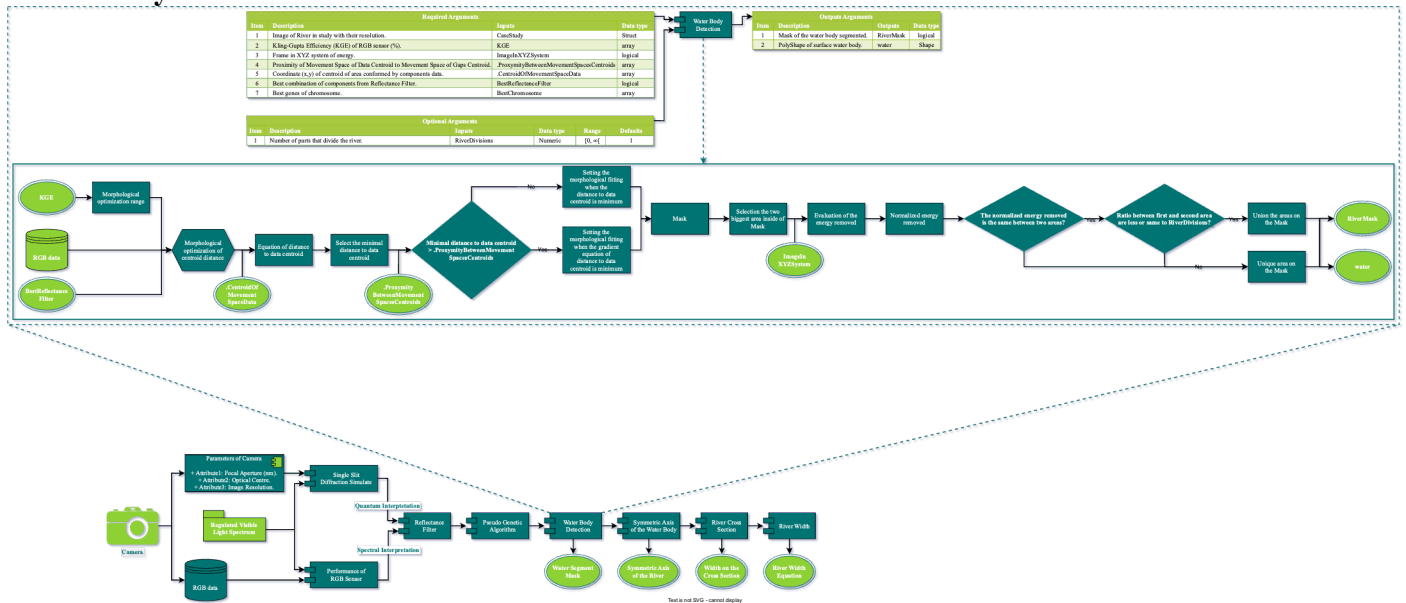
Reflectance filter:



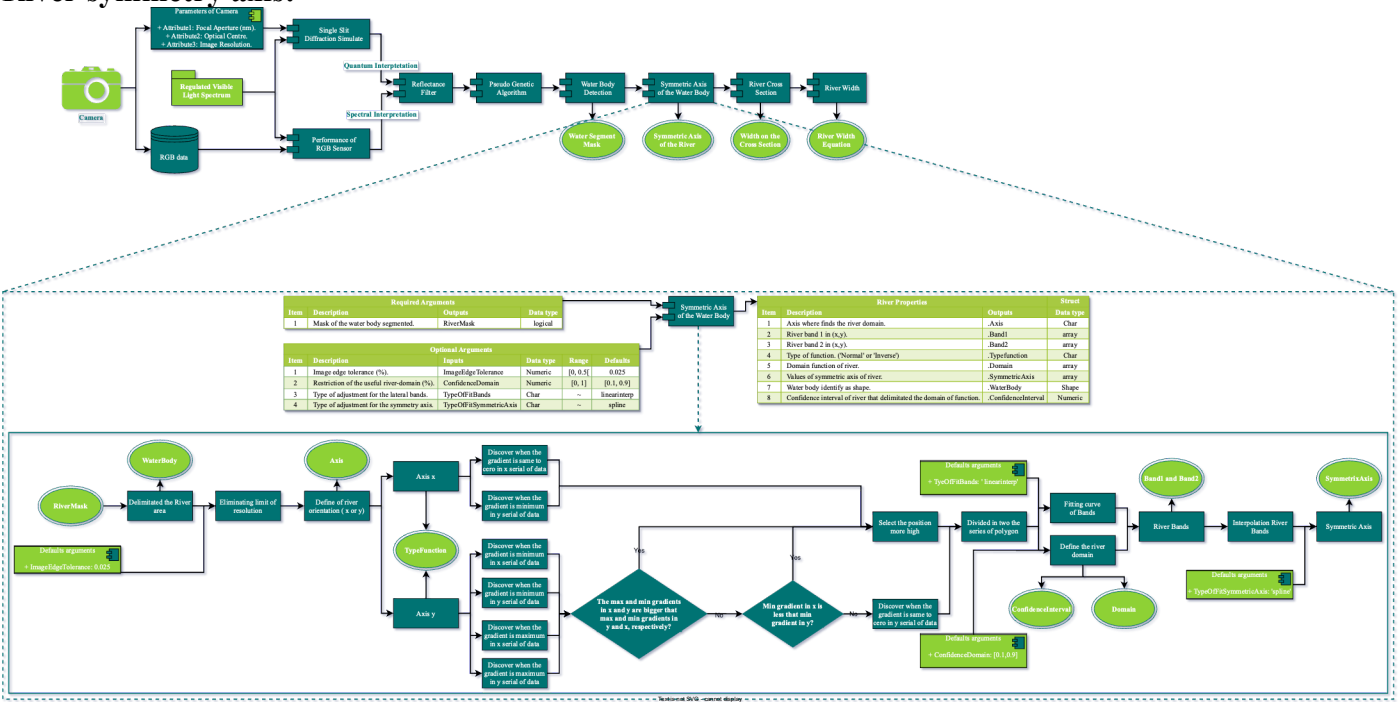
Pseudo genetic algorithm:



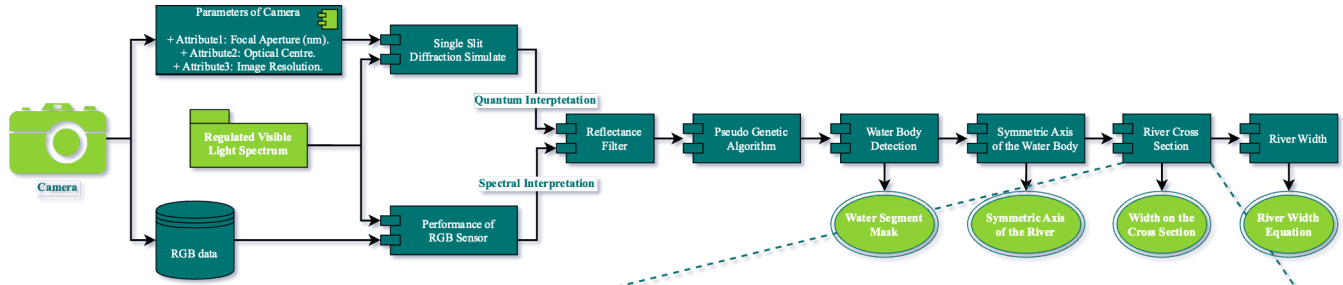
Water body detection:



River symmetry axis:



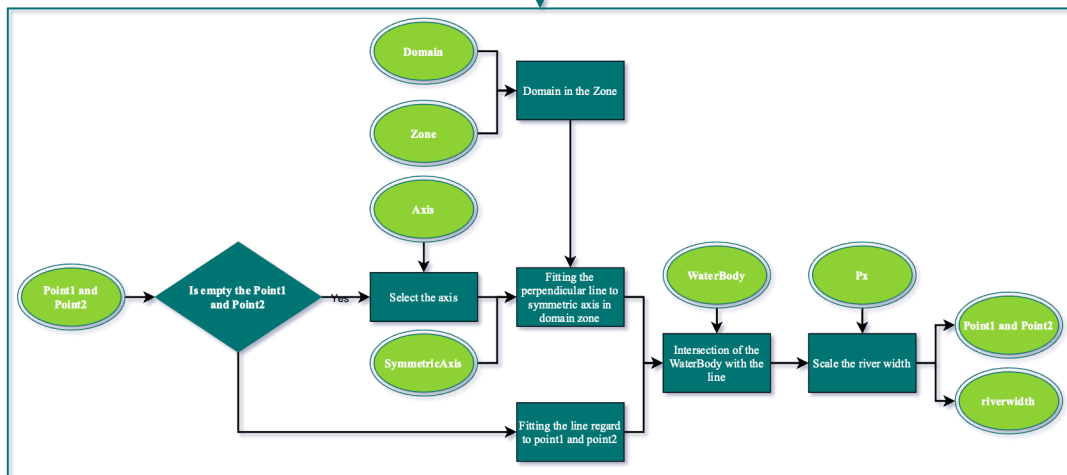
River cross section:



Required Arguments			Struct
Item	Description	Outputs	Data type
1	Axis where finds the river domain.	.Axis	Char
2	Domain function of river.	.Domain	array
3	Values of symmetric axis of river.	.SymmetricAxis	array
4	Water body identify as shape.	.WaterBody	Shape

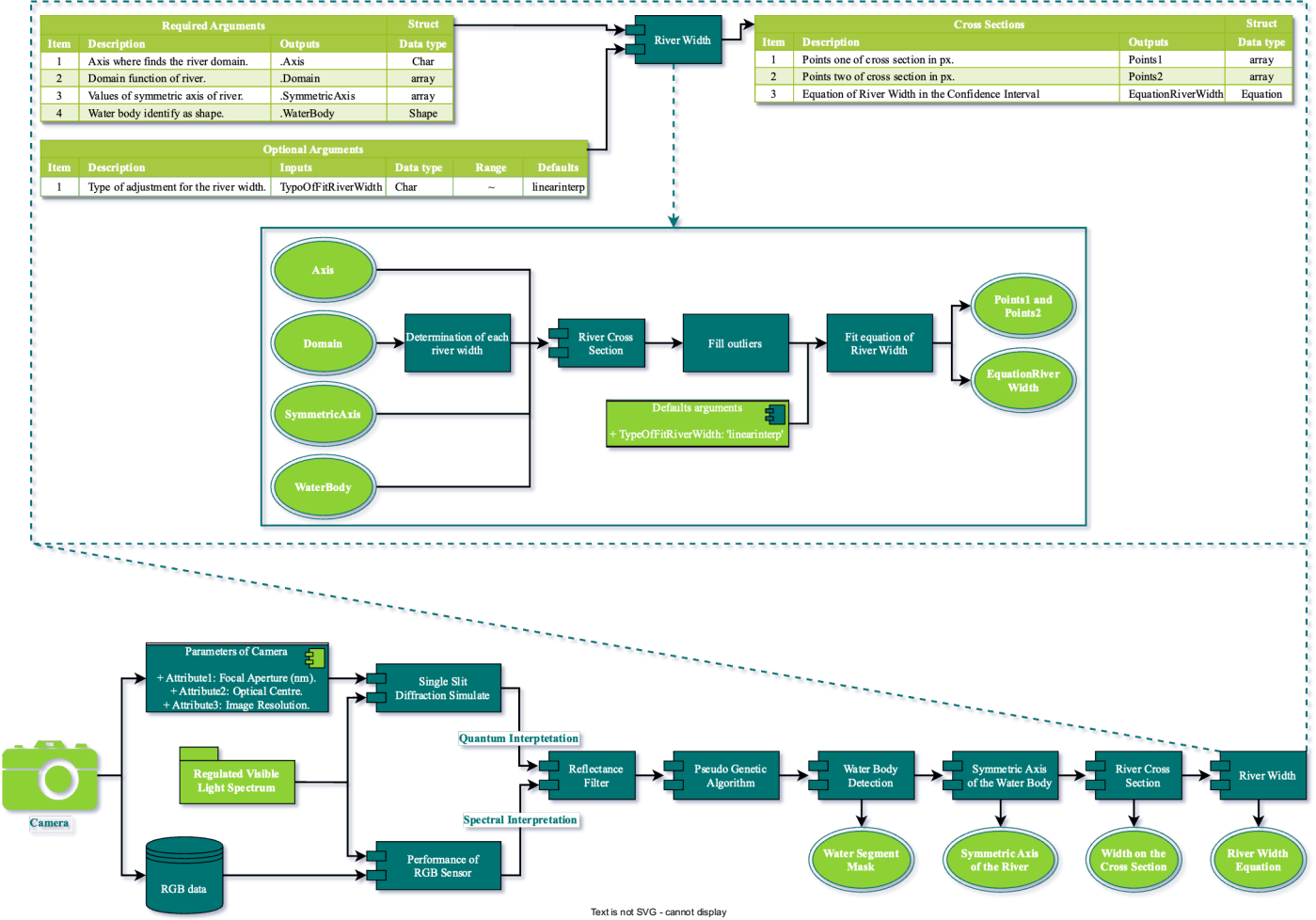
Optional Arguments					
Item	Description	Inputs	Data type	Range	Defaults
1	Location of domain where you can measurement the river width.	Zone	Numeric	[0, 0.5[0.025
2	Scale factor from pixel to meter.	Px	Numeric	[0, ∞[1
3	Point 1 a particular cross-section (x1,y1).	Point1	Numeric	~	([1,1])
4	Point 2 a particular cross-section (x2,y2).	Point2	Numeric	~	([1,1])

Outputs Arguments			Data type
Item	Description	Outputs	Data type
1	Point one of cross section in px.	Point1	Numeric
2	Point two of cross section in px.	Point2	Numeric
3	River width in the cross section in meters.	riverwidth	Numeric



Text is not-SVG= cannot display

River width:



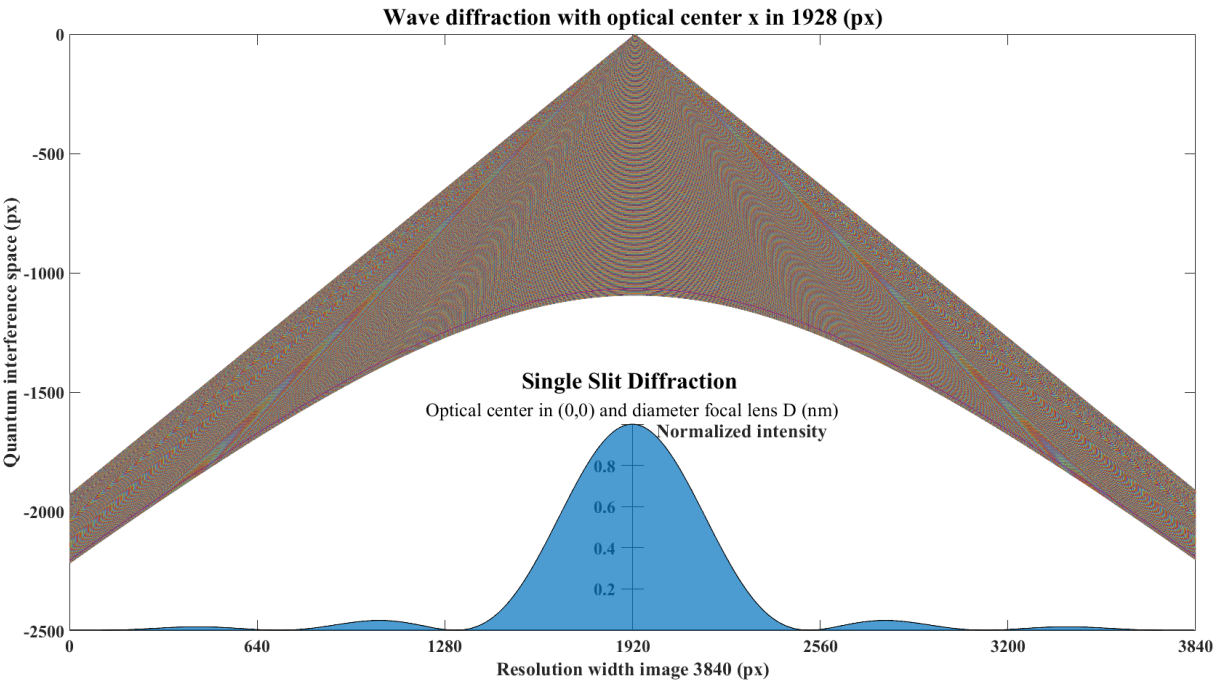
Supplementary Material C – Case studies information and performance of WATER

Data partially obtained from the [supporting files](#) of **Bandini et al. (2021)** “*A drone-borne method to jointly estimate discharge and Manning’s roughness of natural streams*”. Water Resources Research, 57(2), e2020WR028266.

Characteristics and Properties of the rivers							Area (m ²)			Perimeter (m)		
ID	Stream Name	Aquatic Vegetation	Discharge (l/s)	Slope (-)	Width (m)	Px (m/pixel)	WATER	Manual	Error	WATER	Manual	Error
1	Egtved Å XS1	High density vegetation	923	0.00160	6.75	0.00590	49.37	49.86	-1.00%	36	46	-20.40%
2	Egtved Å XS3	High density vegetation	822	0.00192	5.00	0.00540	50.6	54.15	-6.60%	43	54	-20.00%
3	Egtved Å XS4	No vegetation, clean bottom	766	0.00120	6.50	0.00421	40.34	38.61	4.50%	42	58	-27.10%
4	Egtved Å XS2	High density vegetation	784	0.00069	7.95	0.00570	120.48	117.5	2.50%	70	78	-9.60%
5	Grindsted Å ST10	Vegetation patches	2169	0.00128	8.70	0.00590	130.67	140.15	-6.80%	70	74	-4.20%
6	Grindsted Å ST8	Vegetation patches	2186	0.00082	6.10	0.00501	79.33	77.98	1.70%	63	61	4.10%
7	Grindsted Å ST310358	Vegetation patches	1655	0.00128	7.90	0.00634	130.36	129.06	1.00%	68	86	-20.20%
8	Grindsted Å ST1	Vegetation patches	1592	0.00032	8.45	0.00550	96.69	82.71	16.90%	72	82	-12.70%
9	Grindsted Å ST12	Vegetation patches	2482	0.00112	10.20	0.00678	163.92	167.01	-1.90%	64	74	-13.60%
10	Grindsted Å ST14	Vegetation patches	3640	0.00133	11.40	0.00841	202.37	182.83	10.70%	108	111	-3.10%
11	Grindsted Å ST310357	Vegetation patches	1866	0.00027	6.50	0.00570	86.95	87.47	-0.60%	83	71	16.70%
12	Grindsted Å ST6	Vegetation patches	1774	0.00093	7.30	0.00647	144.88	143.08	1.30%	75	96	-21.60%
13	Grindsted Å ST7	Vegetation patches	2182	0.00099	7.00	0.00674	128.86	135.52	-4.90%	82	97	-14.90%
14	Grindsted Å ST9	Vegetation patches	2543	0.00089	8.80	0.00498	93.55	92.96	0.60%	63	61	3.00%
15	Usserød Bridge	No vegetation, clean bottom	877	0.00049	6.20	0.00566	55.69	53.59	3.90%	39	45	-13.40%
16	Usserød Å Factory	No vegetation, clean bottom	841	0.00210	6.15	0.00406	45.96	48.09	-4.40%	30	38	-20.80%
17	Usserød Å ST9	No vegetation, clean bottom	999	0.00110	3.86	0.00705	131.19	92.12	42.40%	115	86	34.80%
18	Usserød Å ST7	No vegetation, clean bottom	499	0.00210	3.60	0.00428	47.48	55.89	-15.00%	54	53	2.80%

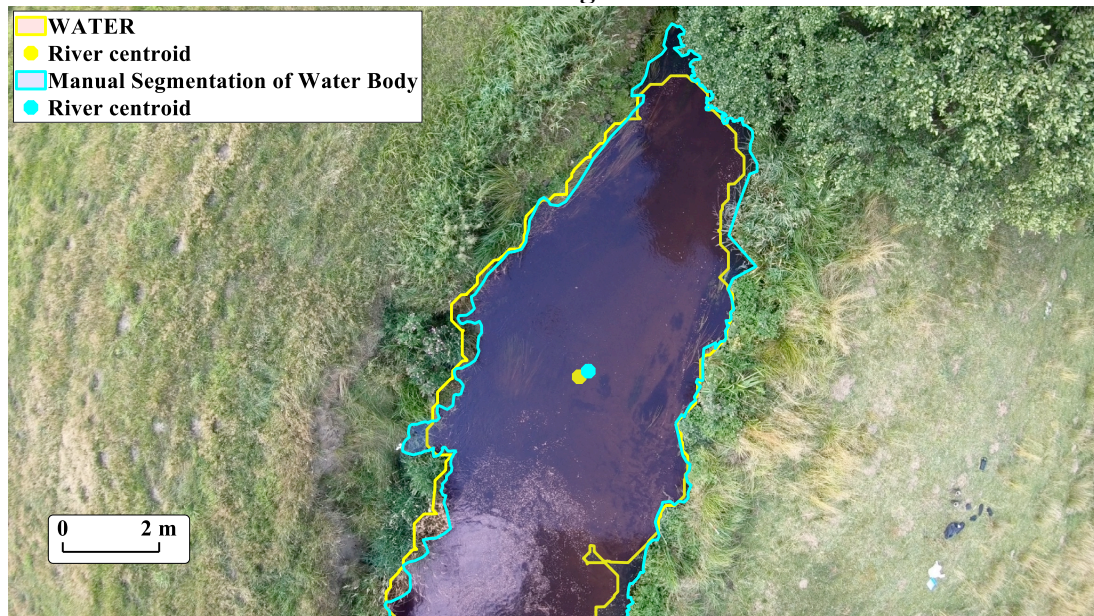
19	Usserød Å ST8	No vegetation, clean bottom	463	0.00056	4.80	0.00668	133.01	130.95	1.60%	77	76	1.40%
20	Vejle Å Ving. XS2	Vegetation patches	2246	0.00150	16.82	0.01140	563.26	545.42	3.30%	157	166	-5.80%
21	Vejle Å Ving. XS1	High density vegetation	3053	0.00070	17.80	0.00521	132.73	104.81	26.60%	86	89	-2.60%
22	Vejle Å XS3	High density vegetation	2423	0.00240	19.17	0.01080	456.72	474.06	-3.70%	175	183	-4.30%
23	Vejle Å XS1	High density vegetation	860	0.00079	7.00	0.00490	76.88	75.74	1.50%	57	77	-25.60%
24	Vejle Å XS2	High density vegetation	1145	0.00024	14.96	0.00840	236.94	250.94	-5.60%	103	126	-17.70%
25	Værebros Å Veksø bro	No vegetation, clean bottom	180	0.00058	3.25	0.00610	77.61	61.69	25.80%	72	68	6.40%
26	Åmose Å XS1	No vegetation, clean bottom	81	0.00025	3.50	0.00423	47.19	45.47	3.80%	43	44	-2.50%
27	Åmose Å XS2	No vegetation, clean bottom	830	0.00100	4.40	0.00543	122.45	124.34	-1.50%	79	64	23.30%
Average			1477	0.00105	8.15	0.00619	135.02	131.93	3.56%	75	80	-6.21%
Max			3640	0.00240	19.17	0.01140	563.26	545.42	42.40%	175	183	34.80%
Min			81	0.00024	3.25	0.00406	40.34	38.61	-15.00%	30	38	-27.10%

Supplementary Material D – Quantum interference for single slit diffraction

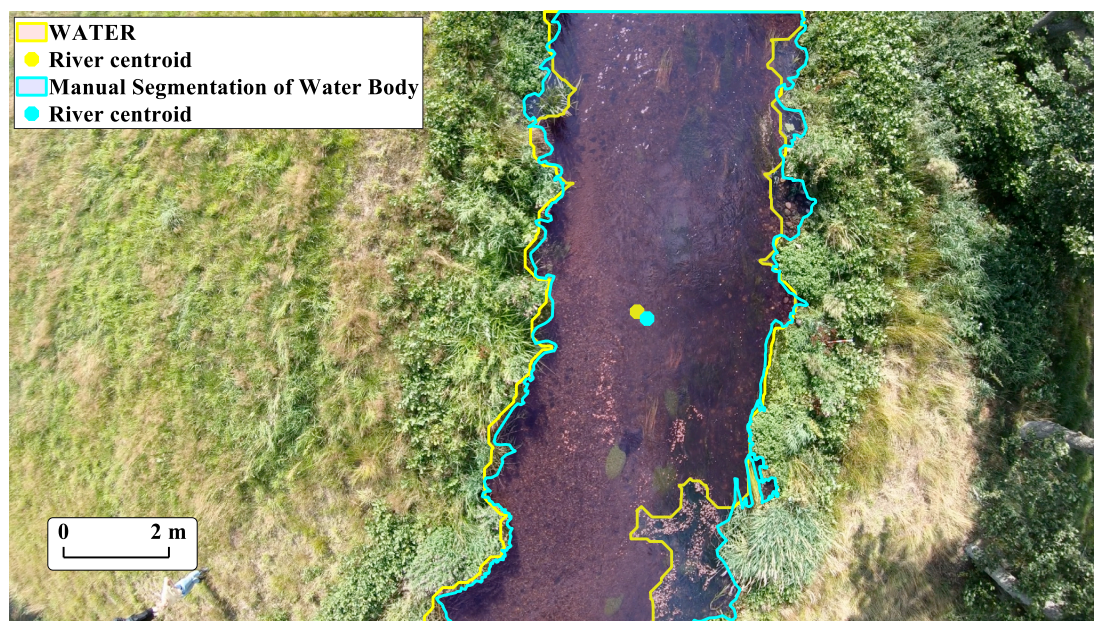


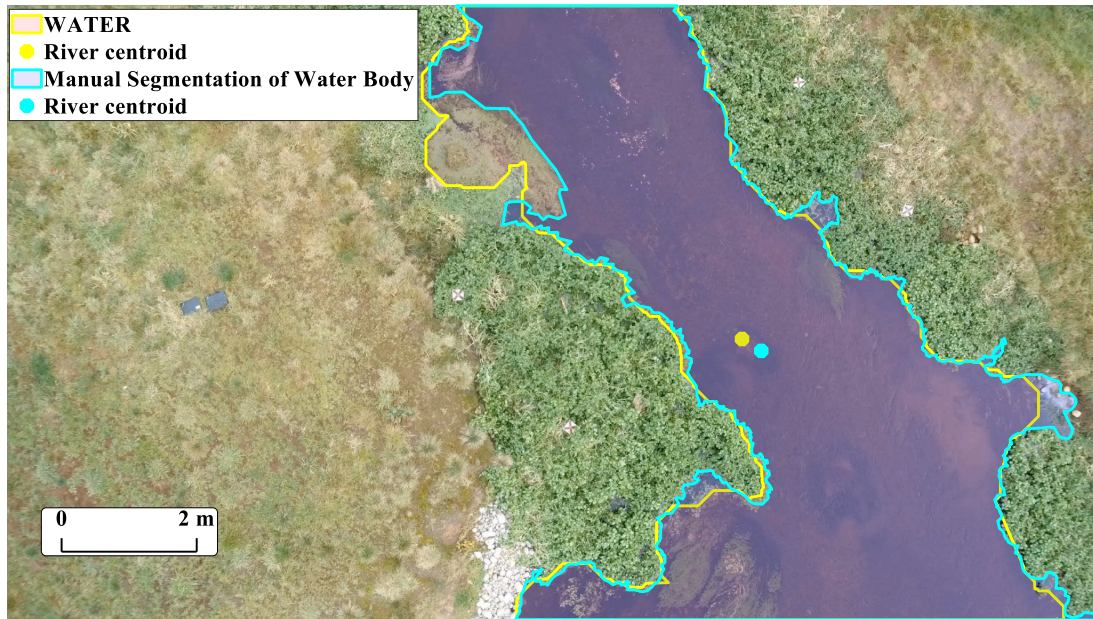
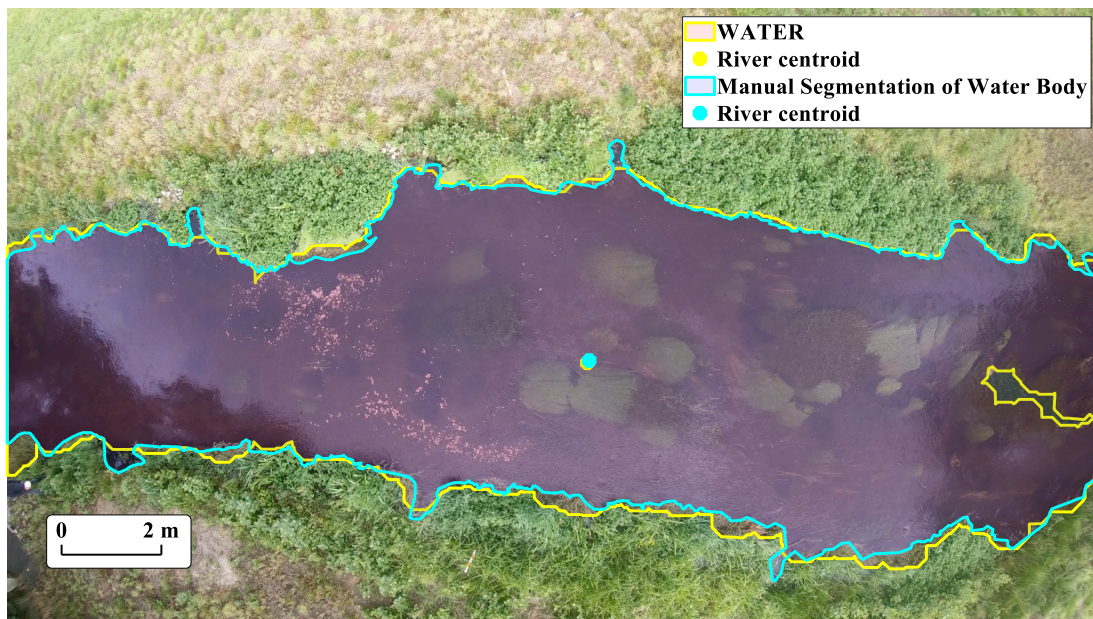
Supplementary Material E – Contrasting human versus machine performance

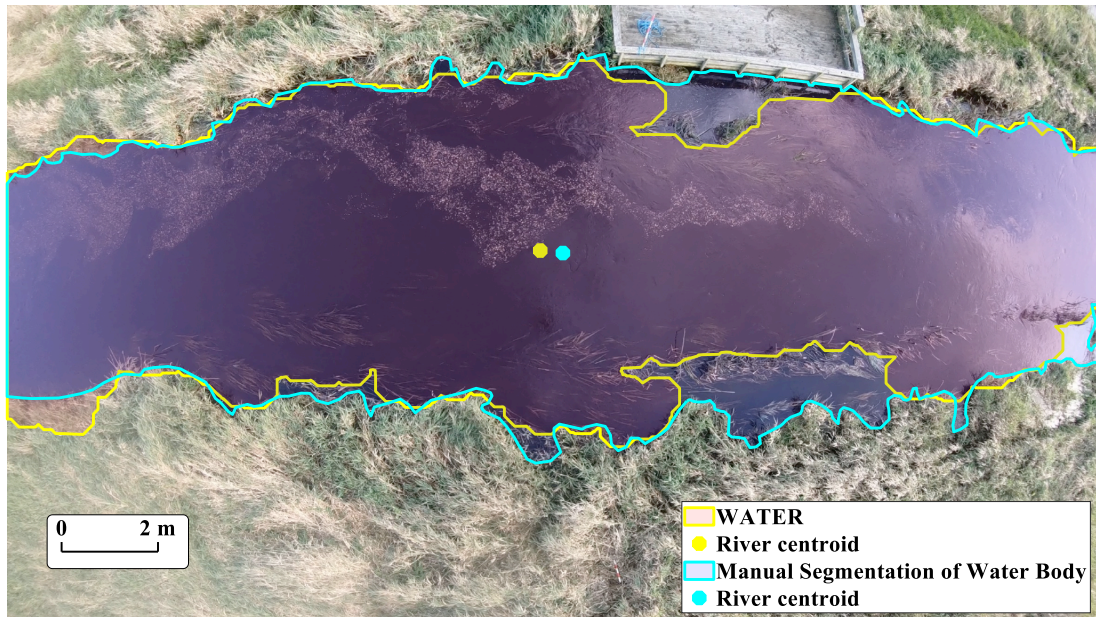
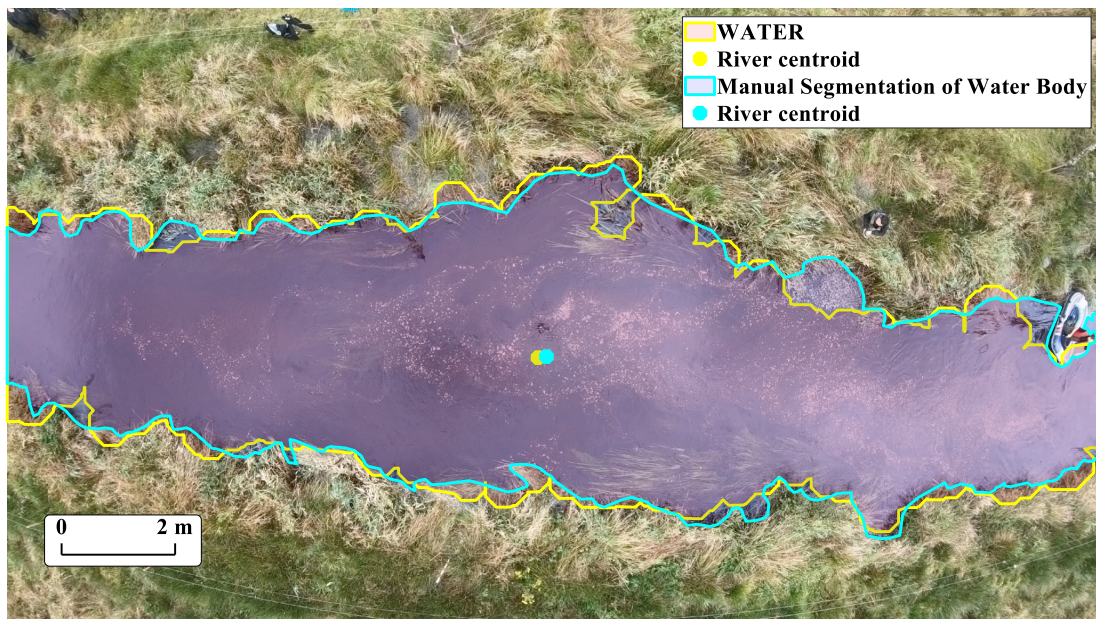
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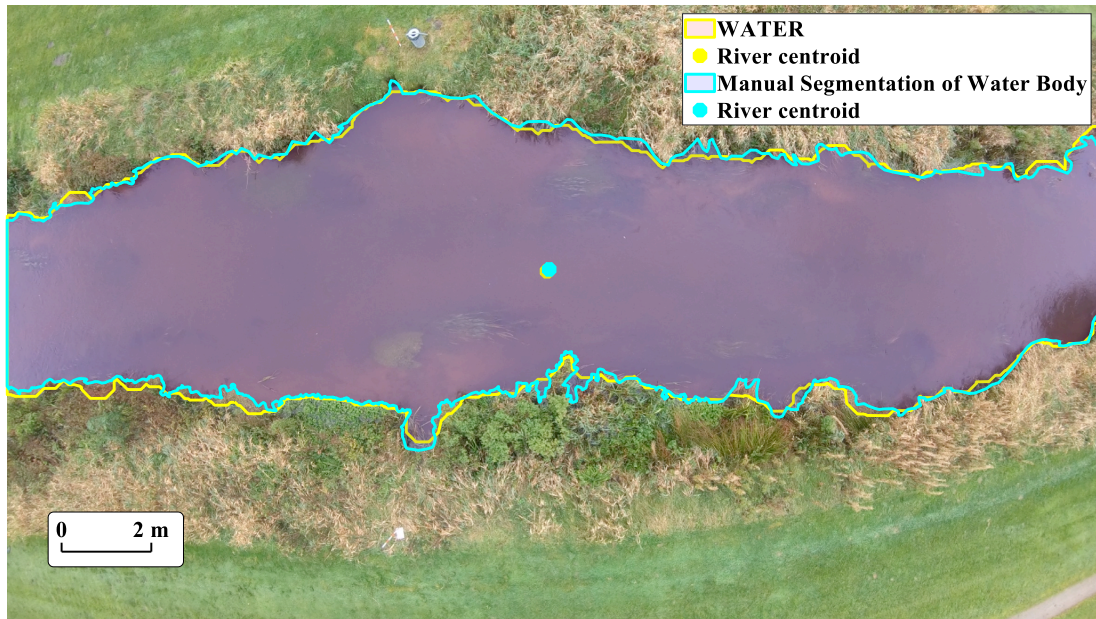
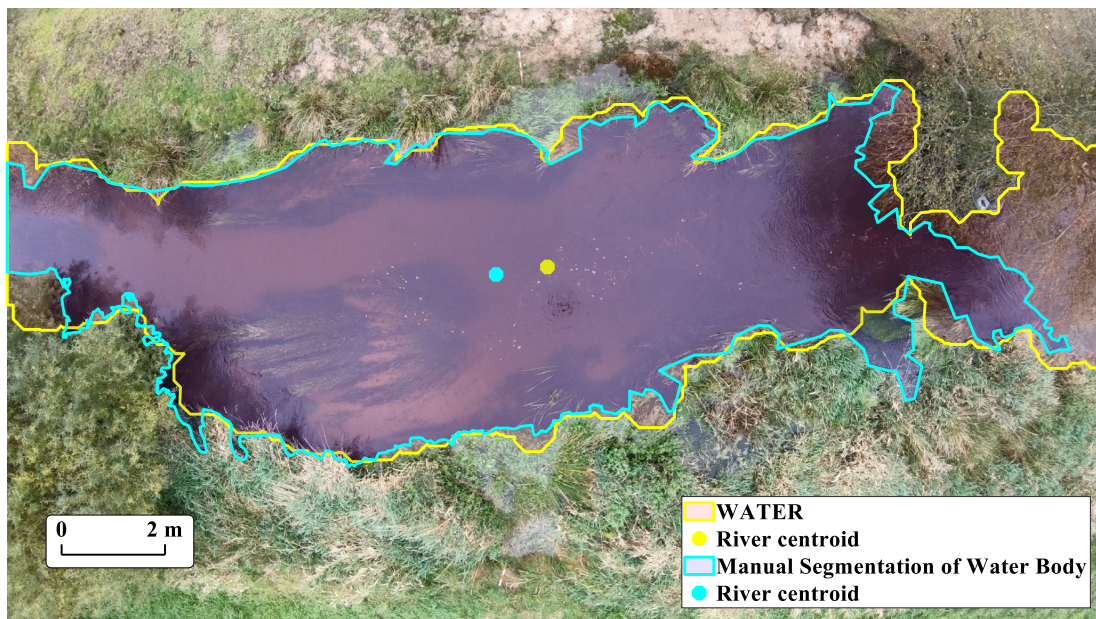


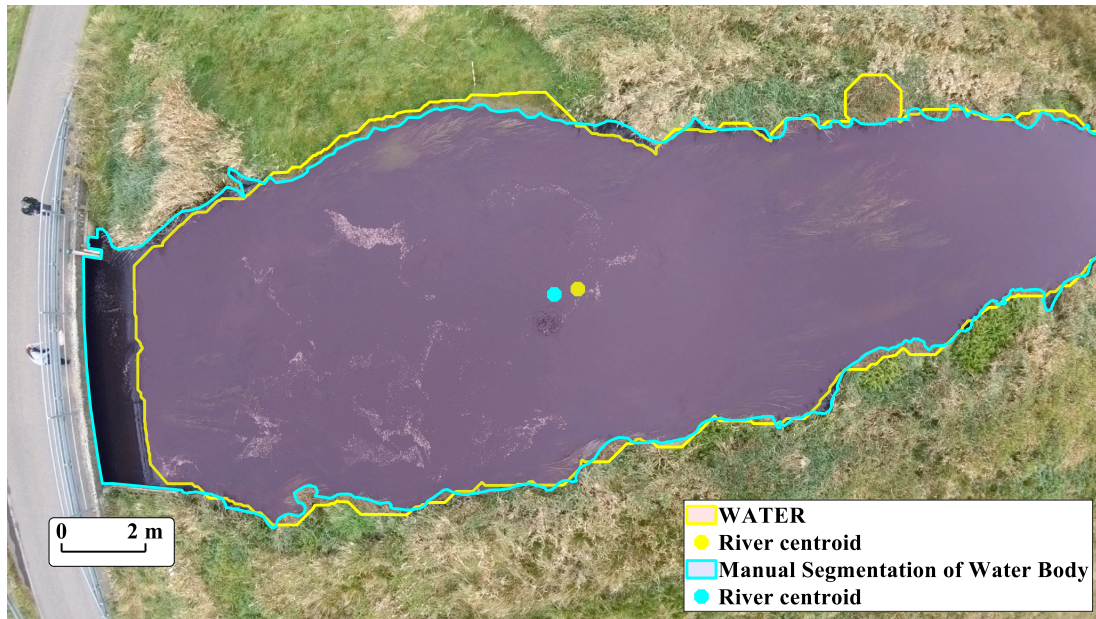
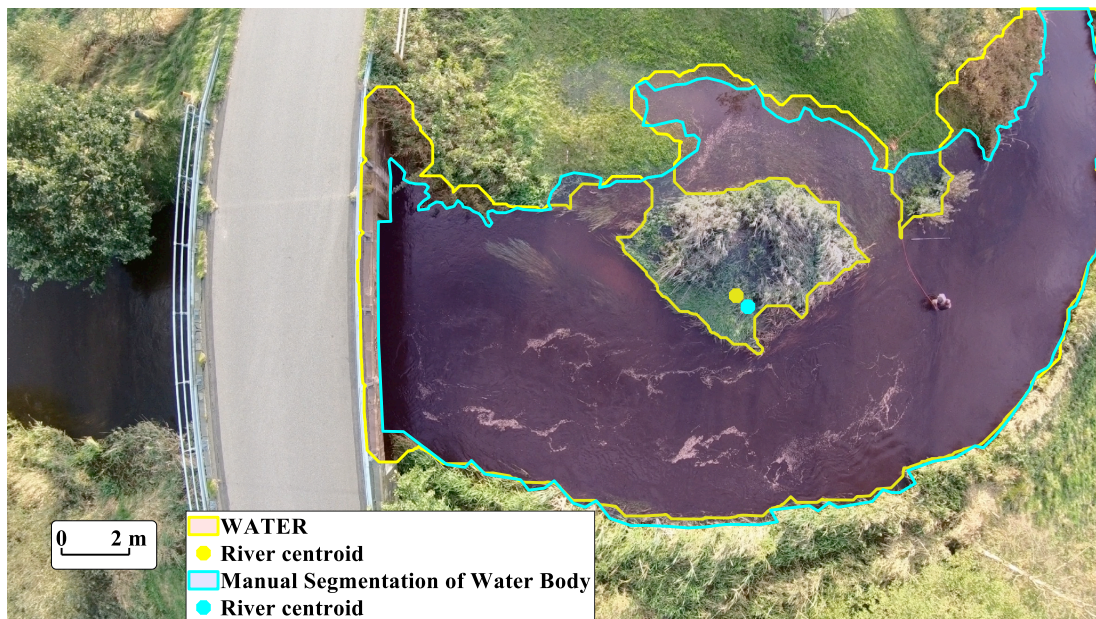
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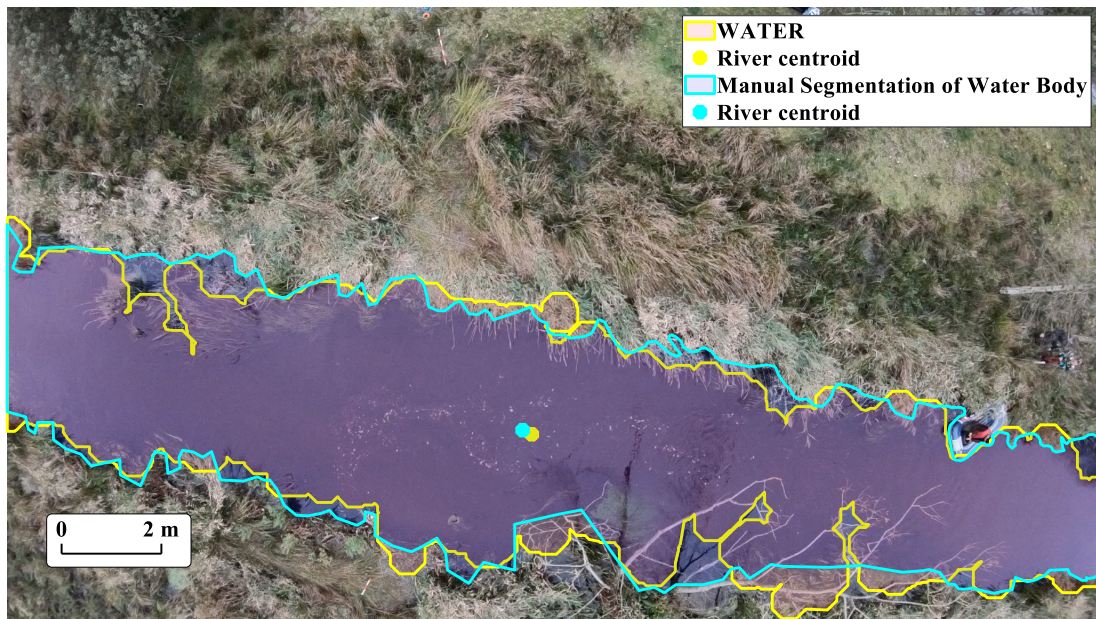
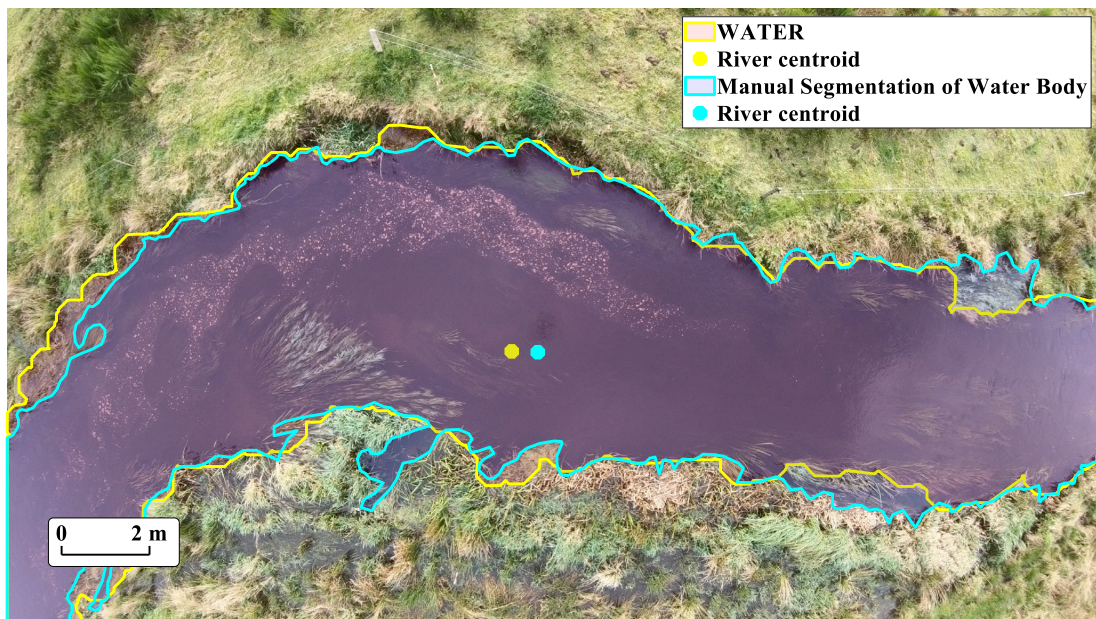


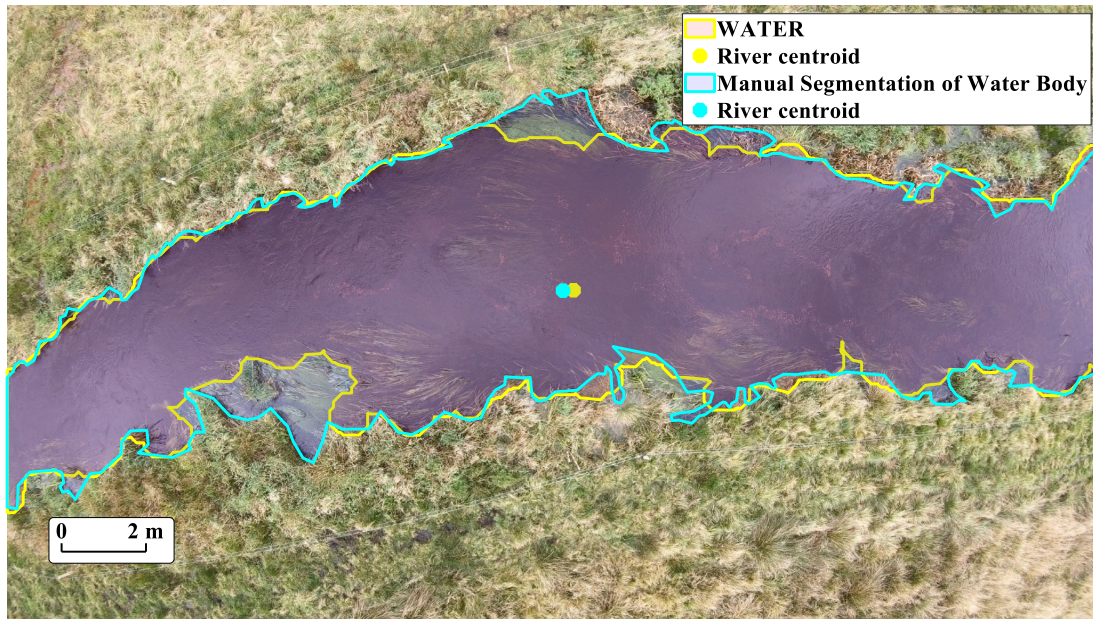
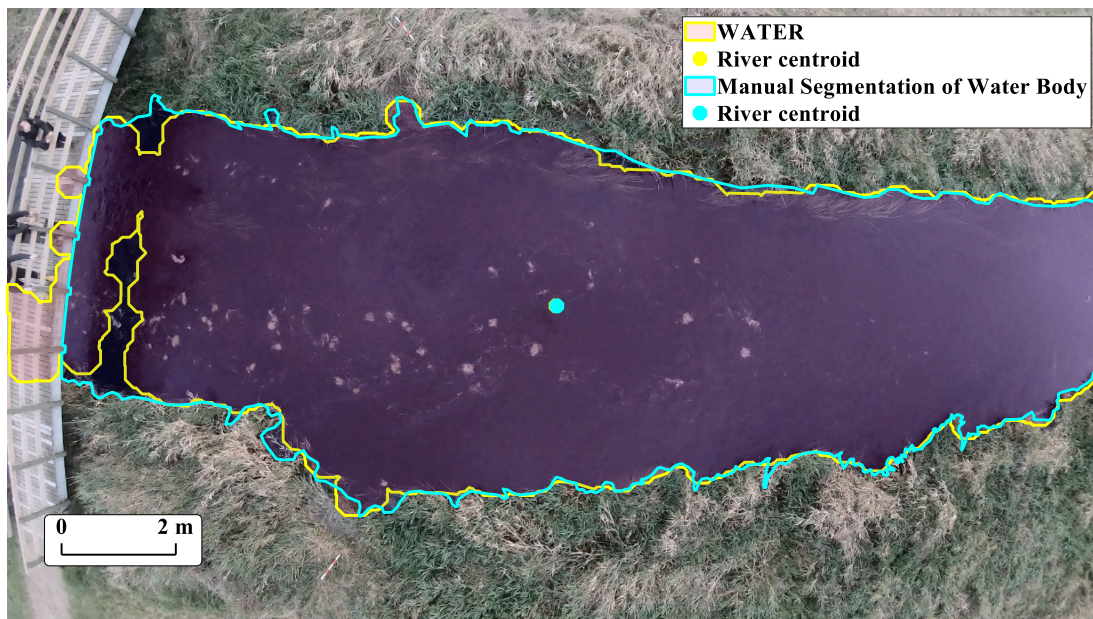
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ID: 5 - Stream Grindsted Å ST10**ID: 6 - Stream Grindsted Å ST8**

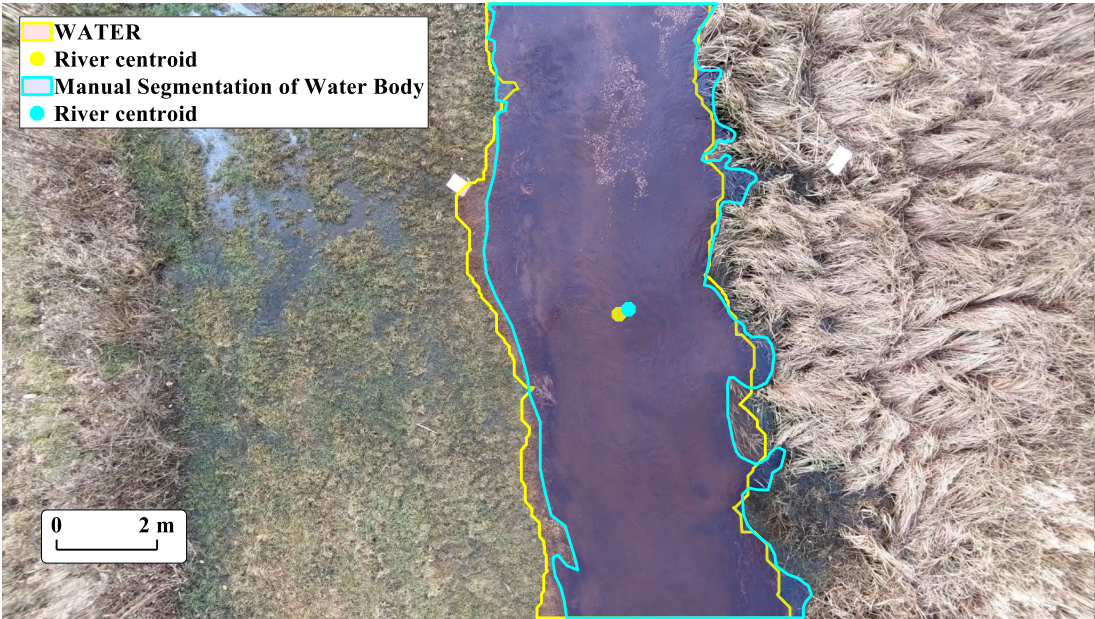
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ID: 9 - Stream Grindsted Å ST12**ID: 10 - Stream Grindsted Å ST14**

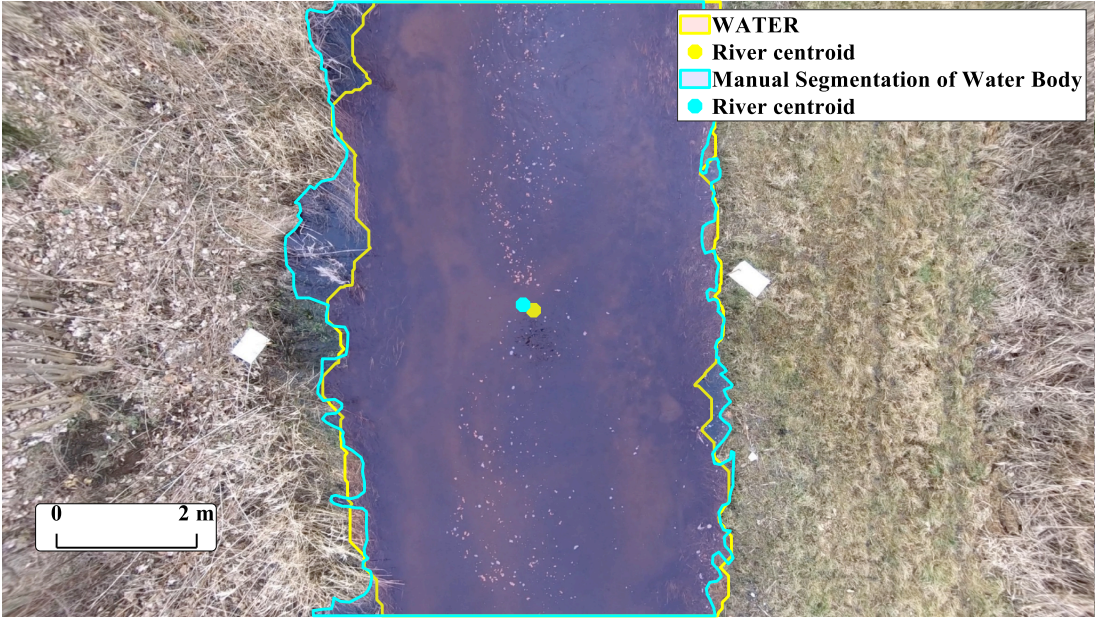
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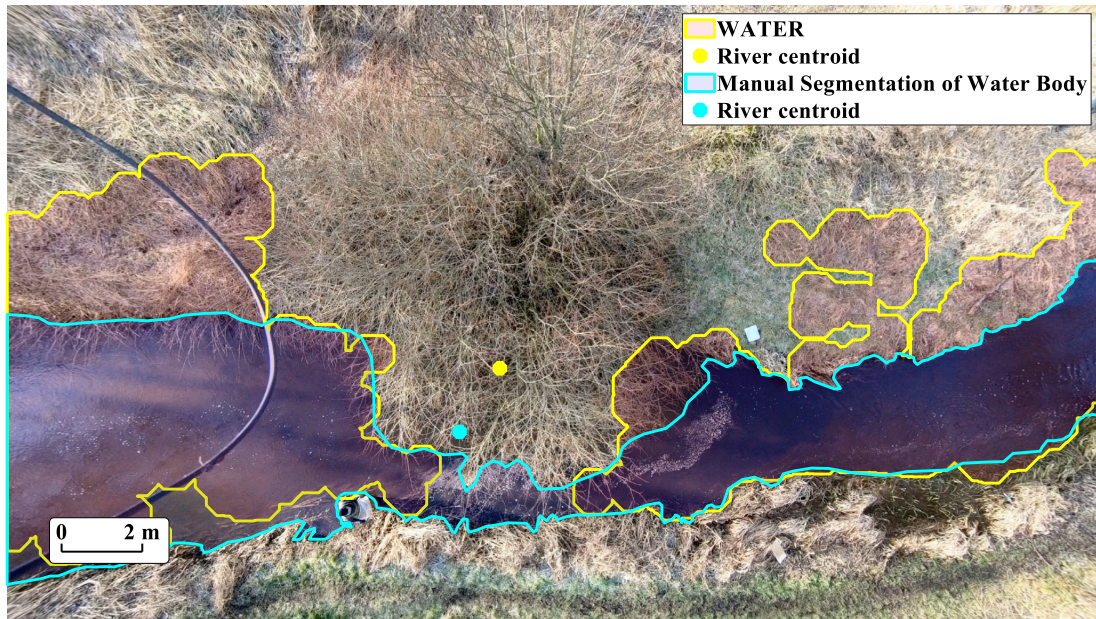
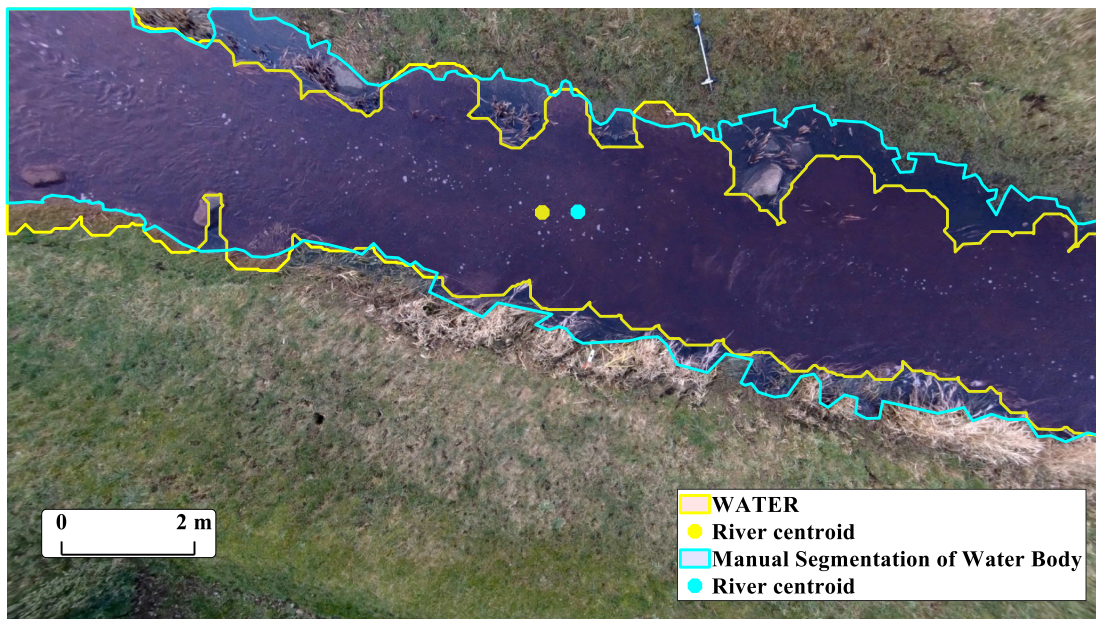
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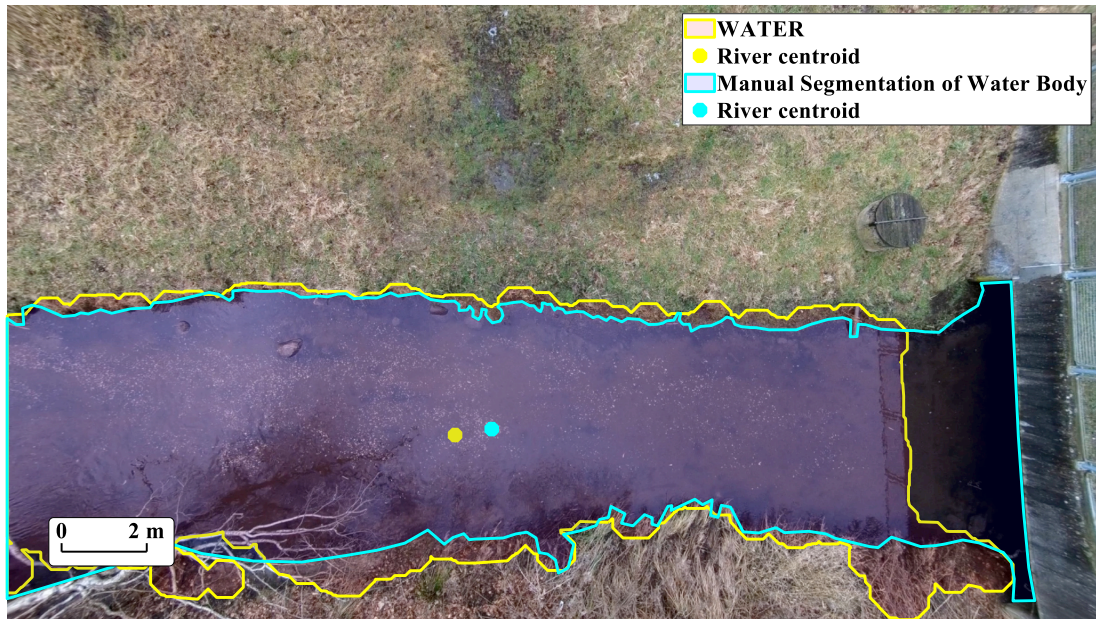
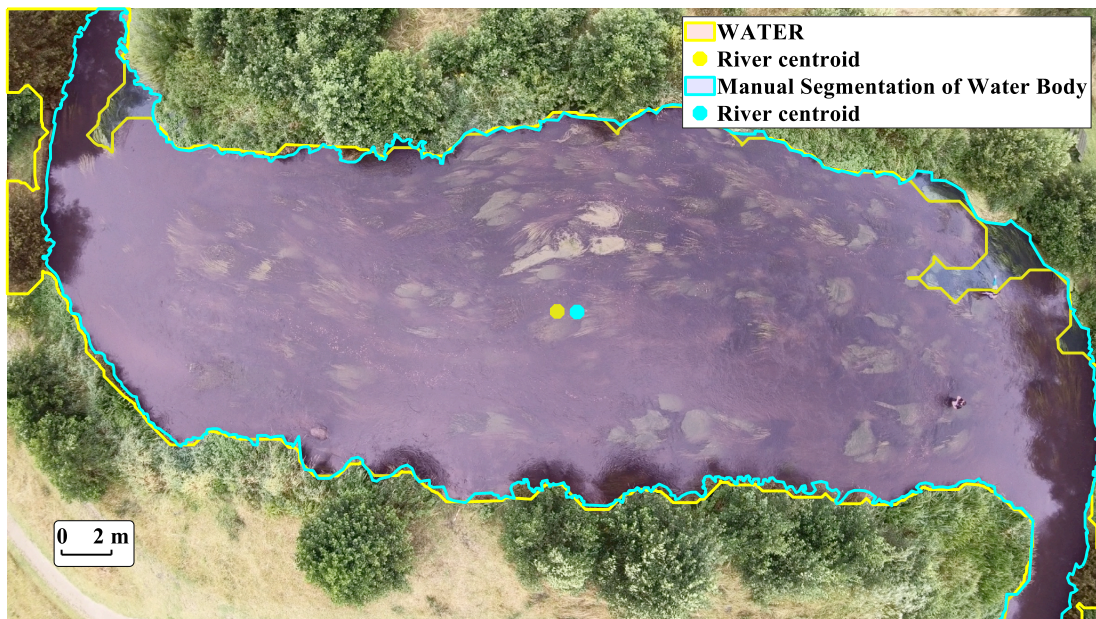
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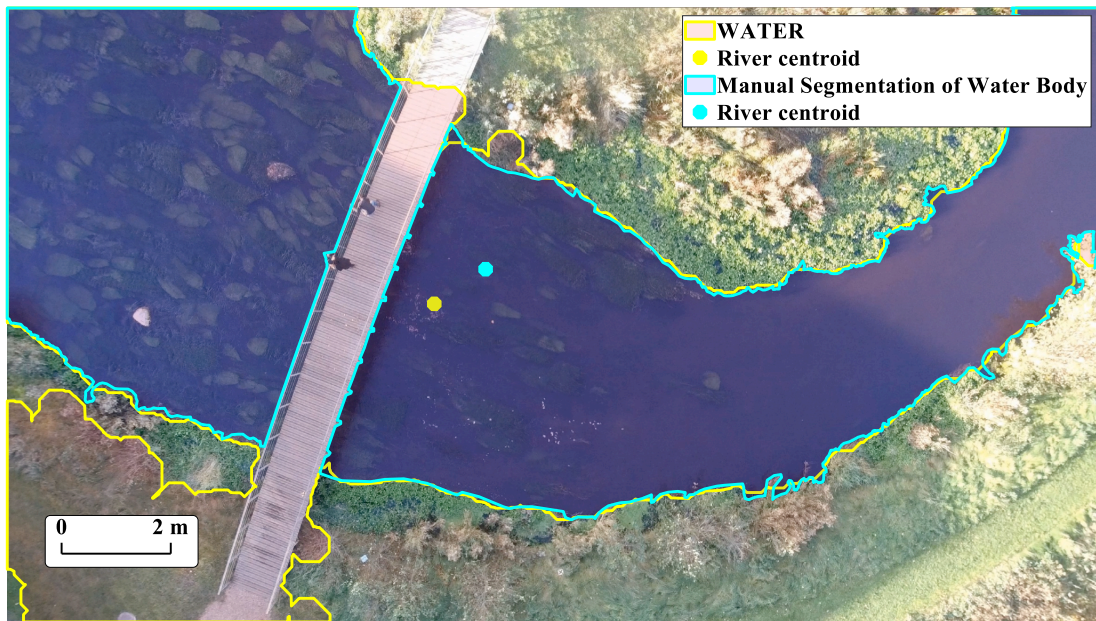
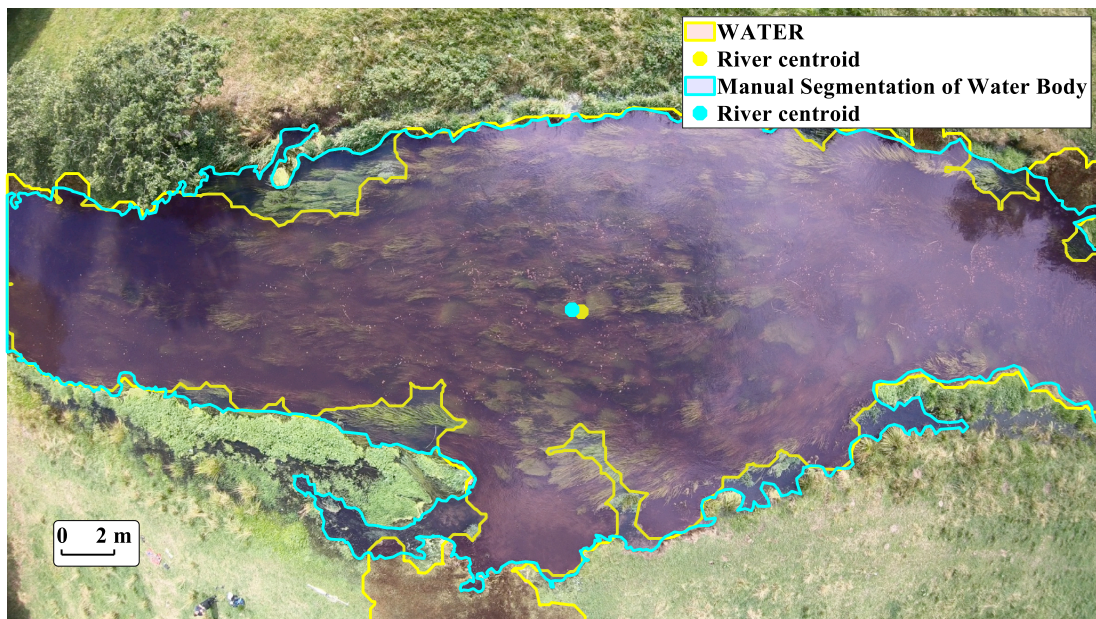


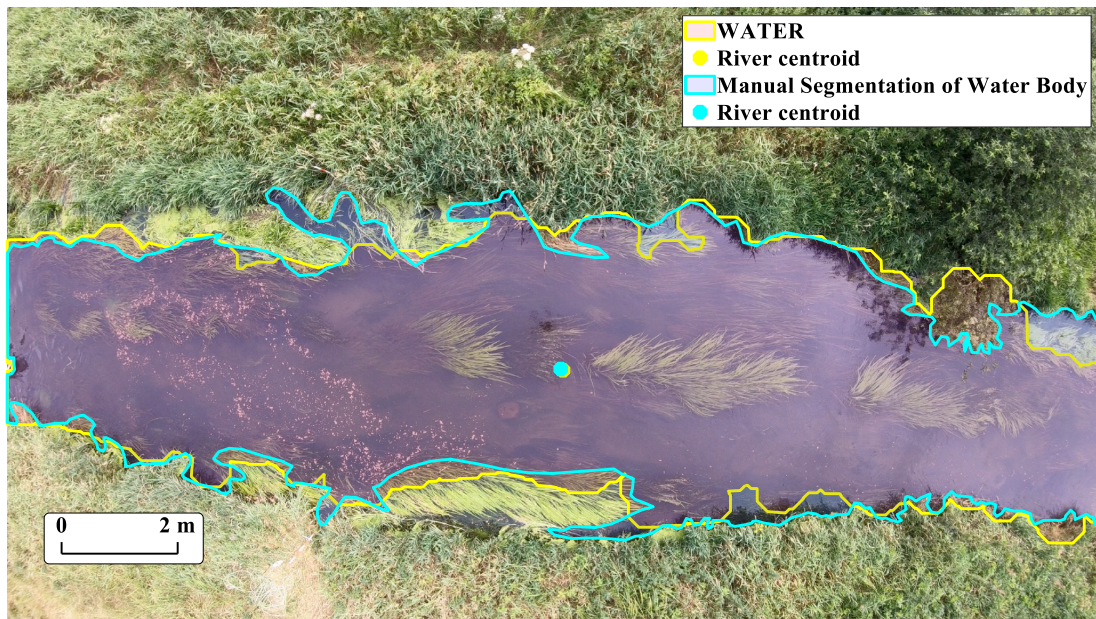
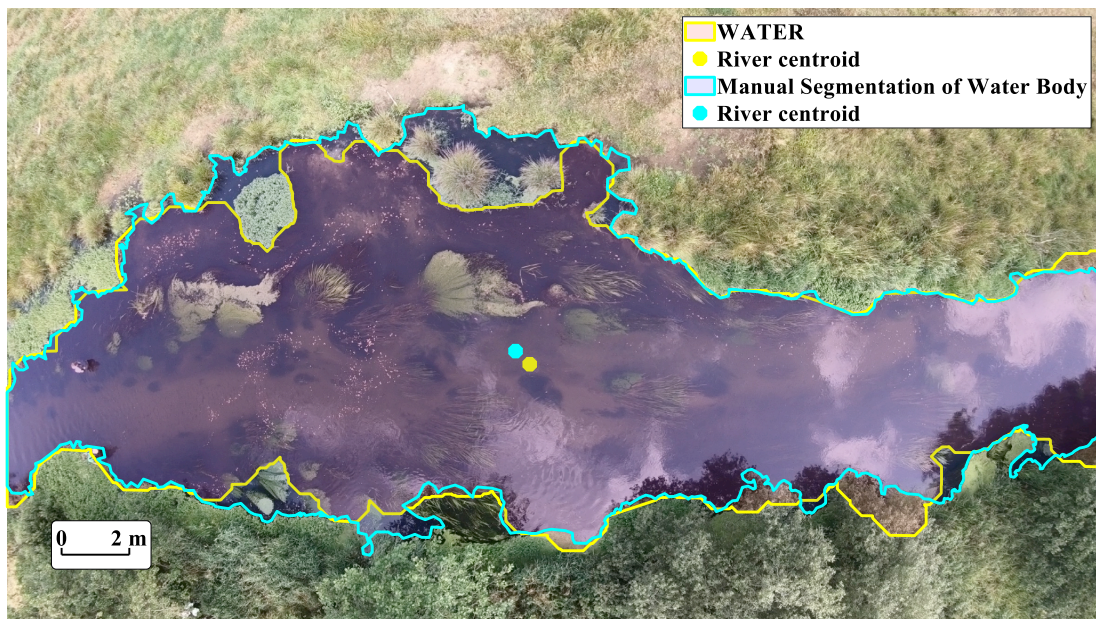
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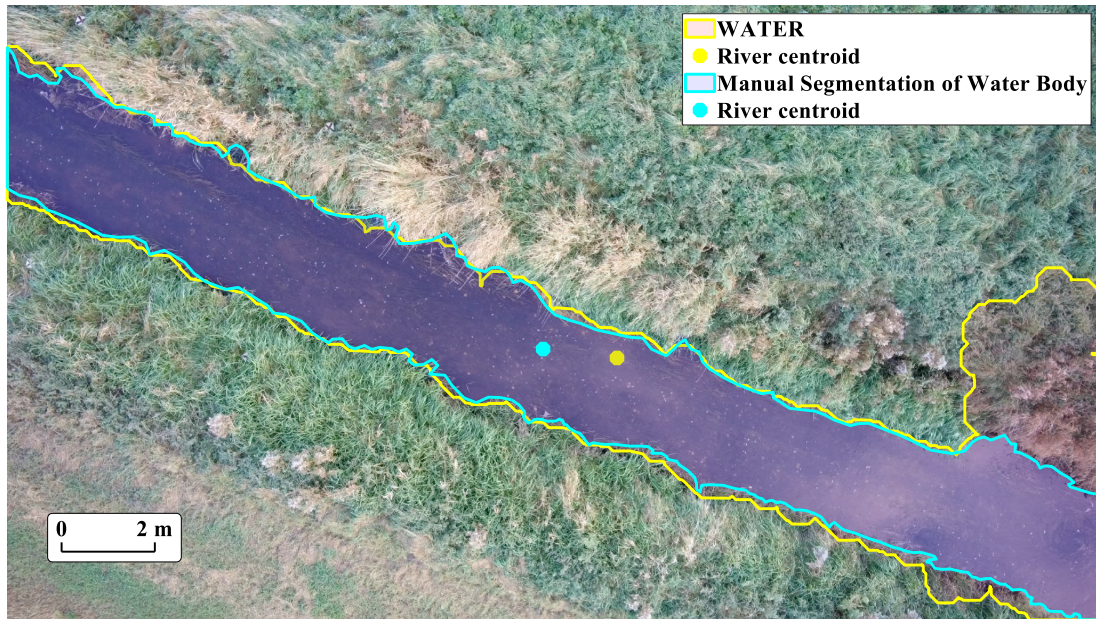
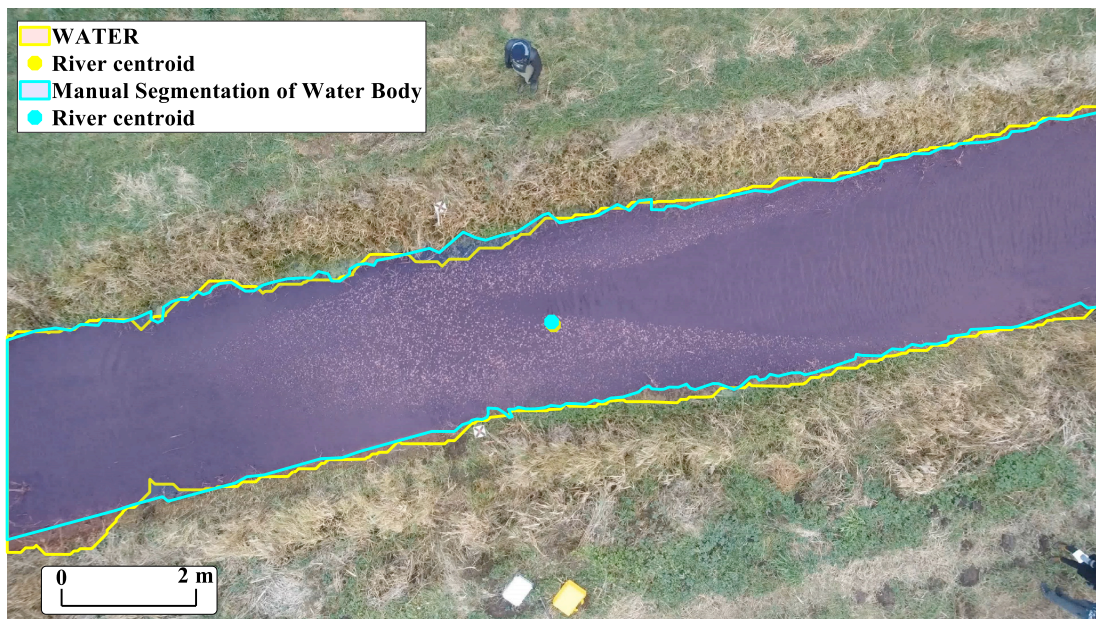


ID: 17 - Stream Usserød Å ST9**ID: 18 - Stream Usserød Å ST7**

ID: 19 - Stream Usserød Å ST8**ID: 20 - Stream Vejle Å Ving. X S2**

ID: 21 - Stream Vejle Å Ving. X S1**ID: 22 - Stream Vejle Å X S3**

ID: 23 - Stream Vejle Å X S1**ID: 24 - Stream Vejle Å X S2**

ID: 25 - Stream Værebro Å Veksø bro**ID: 26 - Stream Amose Å XS1**

ID: 27 - Stream Amose Å XS2