

North Cove Update and Westport Comparison

A coastal landscape featuring a rocky beach, driftwood, tall grasses, and evergreen trees under an overcast sky. The foreground is dominated by tall, dry, golden-brown grasses. To the left, a dark, rocky beach is strewn with driftwood. The ocean is visible on the far left, with white surf breaking. In the background, a line of evergreen trees marks the edge of the land. A small, light-colored building is visible on a distant point of land.

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Washington State Department of Ecology





NAIP Imagery, 2006

Vegetation
Line

2006



NAIP Imagery, 2009

**Vegetation
Line**

- 2006
- 2009



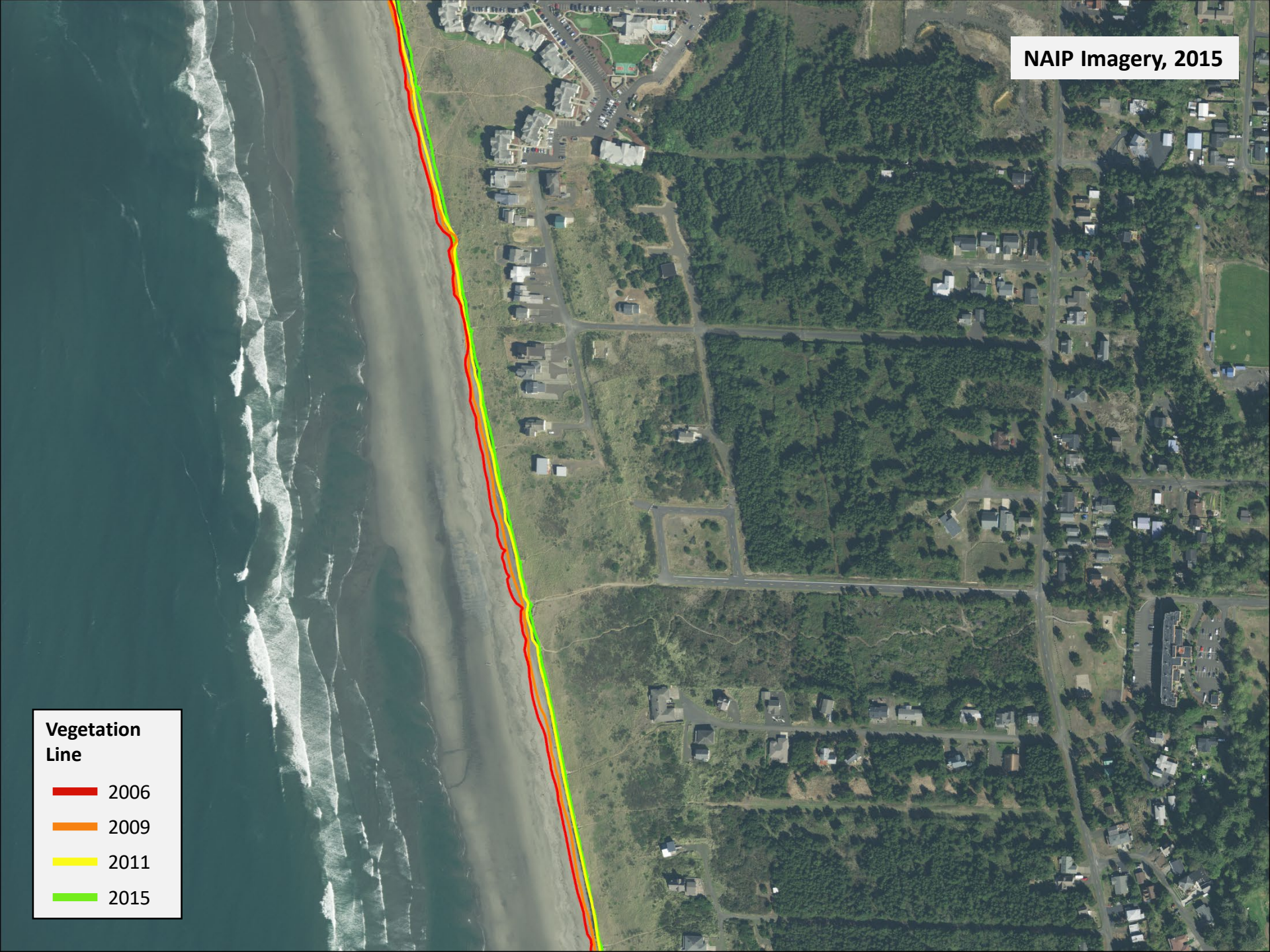
**Vegetation
Line**

- 2006
- 2009
- 2011



**Vegetation
Line**

- 2006
- 2009
- 2011
- 2015



**Vegetation
Line**

- 2006
- 2009
- 2011
- 2015
- 2017

NAIP Imagery, 2019

**Vegetation
Line**



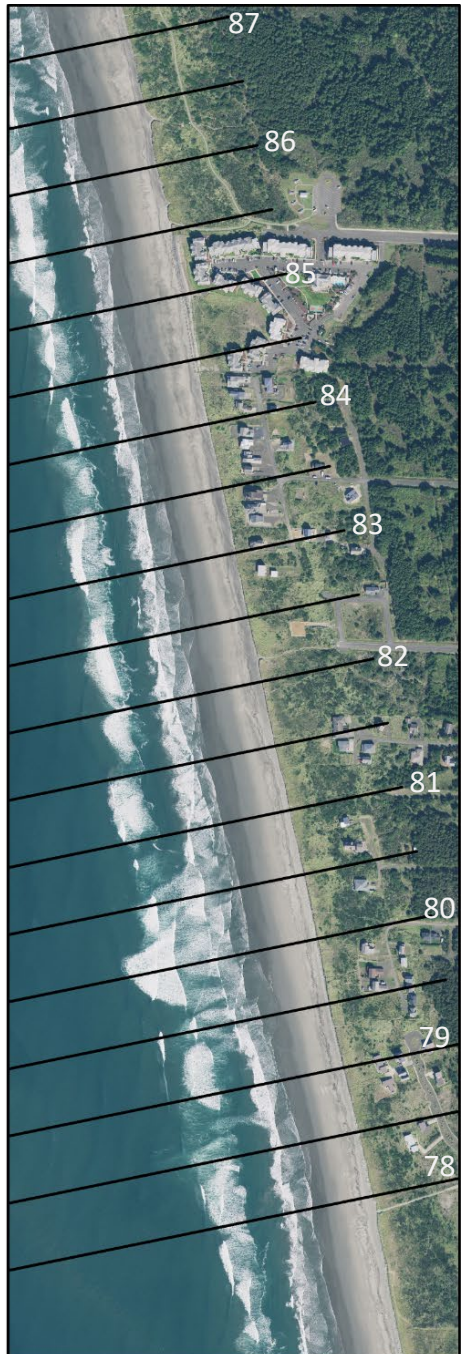
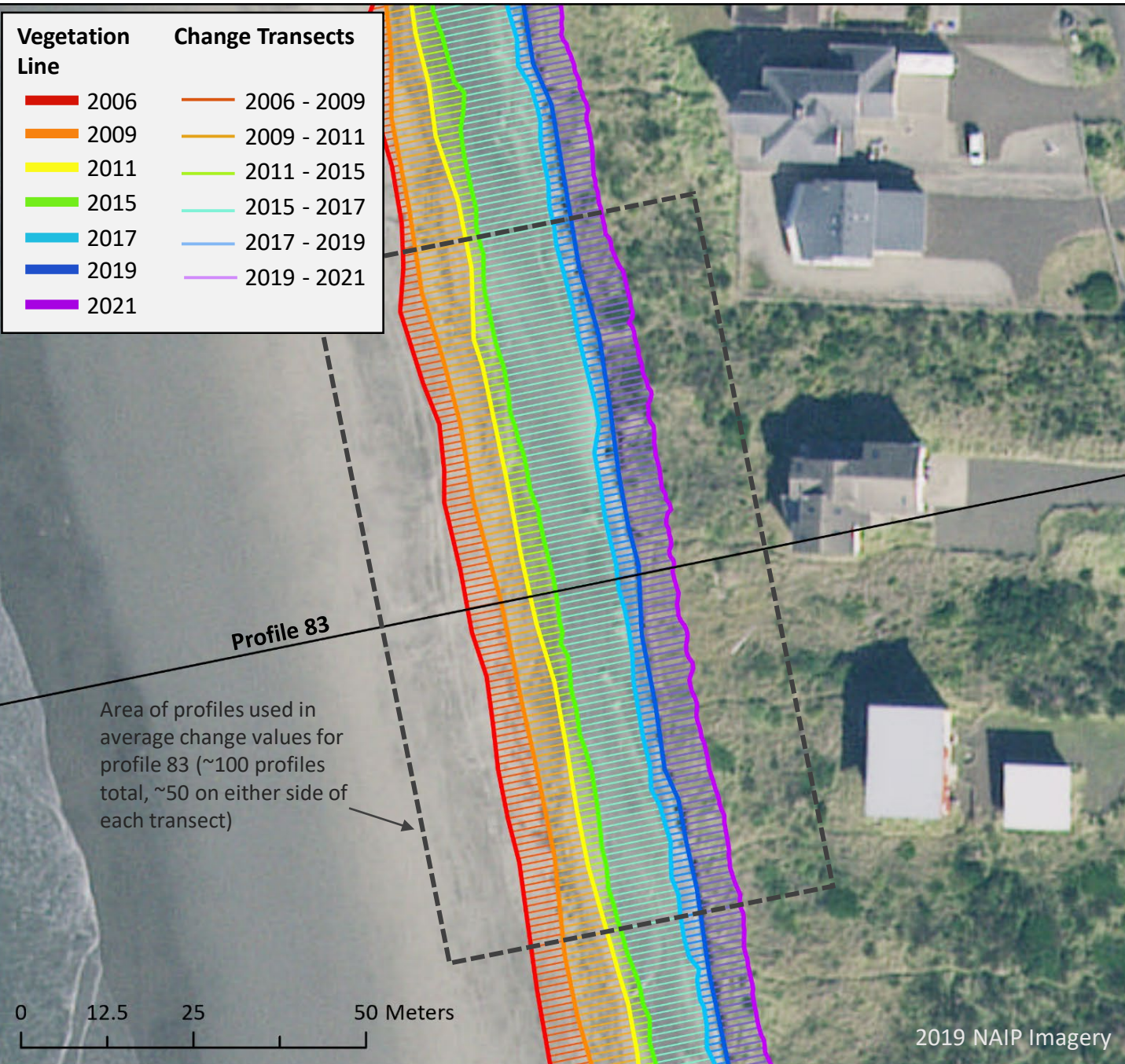
NAIP Imagery, 2019

**Vegetation
Line**

- 2006
- 2009
- 2011
- 2015
- 2017
- 2019
- 2021



Example of scarp top change from Westport





Average Change (meters per year)	Profile	87	86.5	86	85.5	85	84.5	84	83.5	83	82.5	82	81.5	81	80.5	80	79.5	79	78.5	78	Avg.
	2006-2009	-2.5	-2.0	-1.3	-0.1	0.0	-0.4	-1.1	-0.2	-1.5	-1.8	-1.2	-1.5	-1.4	-1.2	-0.8	-1.3	-0.9	-0.1	-0.4	-1.0
	2009-2011	-0.9	-2.0	-1.9	-3.0	-1.8	-1.9	-1.3	-1.9	-2.6	-3.4	-3.3	-3.7	-3.2	-3.0	-2.4	-1.0	-0.9	-0.9	-1.0	-2.1
	2011-2015	-1.5	-2.0	-2.7	-1.9	-1.1	-1.2	-1.0	-0.8	-0.5	-0.5	-0.7	-0.5	-0.5	-0.4	-0.9	-0.5	-0.1	-0.8	-1.3	-1.0
	2015-2017	-7.7	-7.4	-8.5	-8.7	-8.6	-5.5	-3.8	-4.9	-5.0	-3.8	-2.8	-2.4	-3.8	-4.7	-4.2	-3.6	-3.6	-3.7	-4.1	-5.1
	2017-2019	-1.1	-1.9	-1.0	-0.6	0.7	-1.3	-1.3	-1.2	-1.3	-1.1	-1.4	-1.3	-0.8	-0.6	-0.8	-0.9	-1.0	-0.7	-0.7	-1.0
	2019-2021	-1.7	-2.8	-3.1	-3.6	-2.7	-2.5	-2.9	-2.5	-2.9	-2.7	-2.3	-1.6	-1.1	-1.0	-0.7	-1.9	-2.2	-2.2	-1.7	-2.2

NAIP Imagery, 2006

Vegetation
Line

2006



NAIP Imagery, 2009

**Vegetation
Line**

2006
2009



**Vegetation
Line**

- 2006
- 2009
- 2011



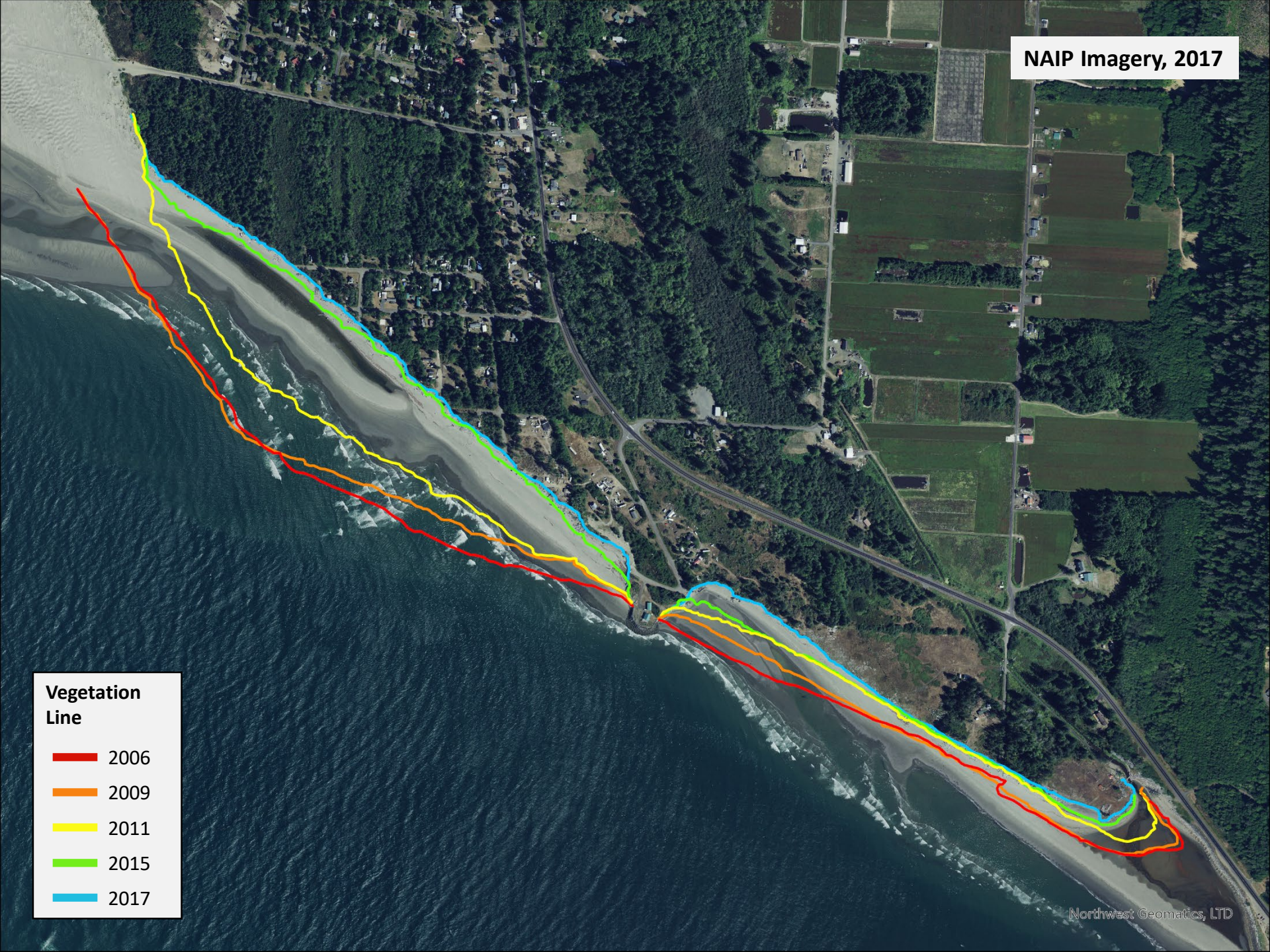
**Vegetation
Line**

- 2006
- 2009
- 2011
- 2015



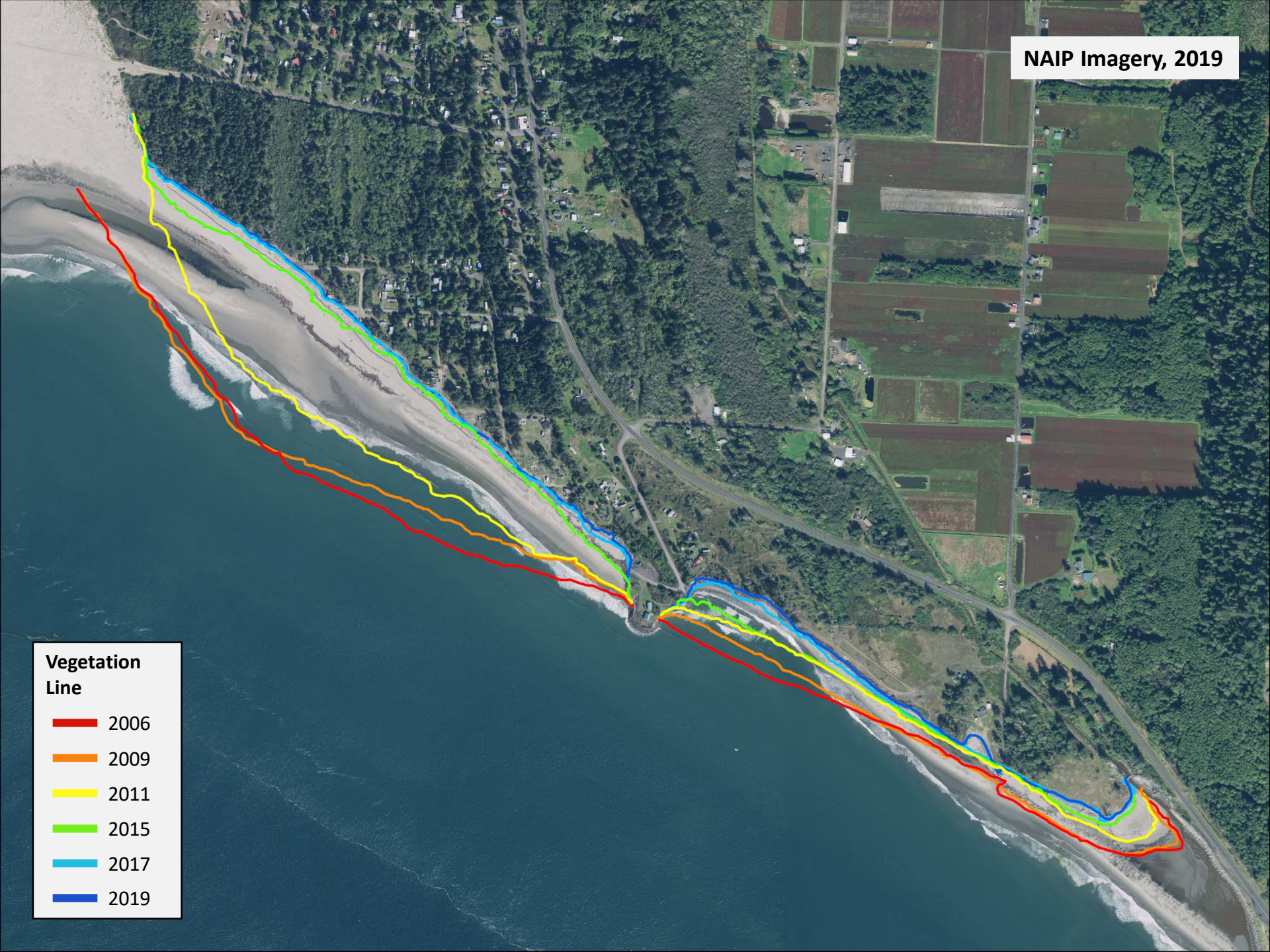
**Vegetation
Line**

- 2006
- 2009
- 2011
- 2015
- 2017



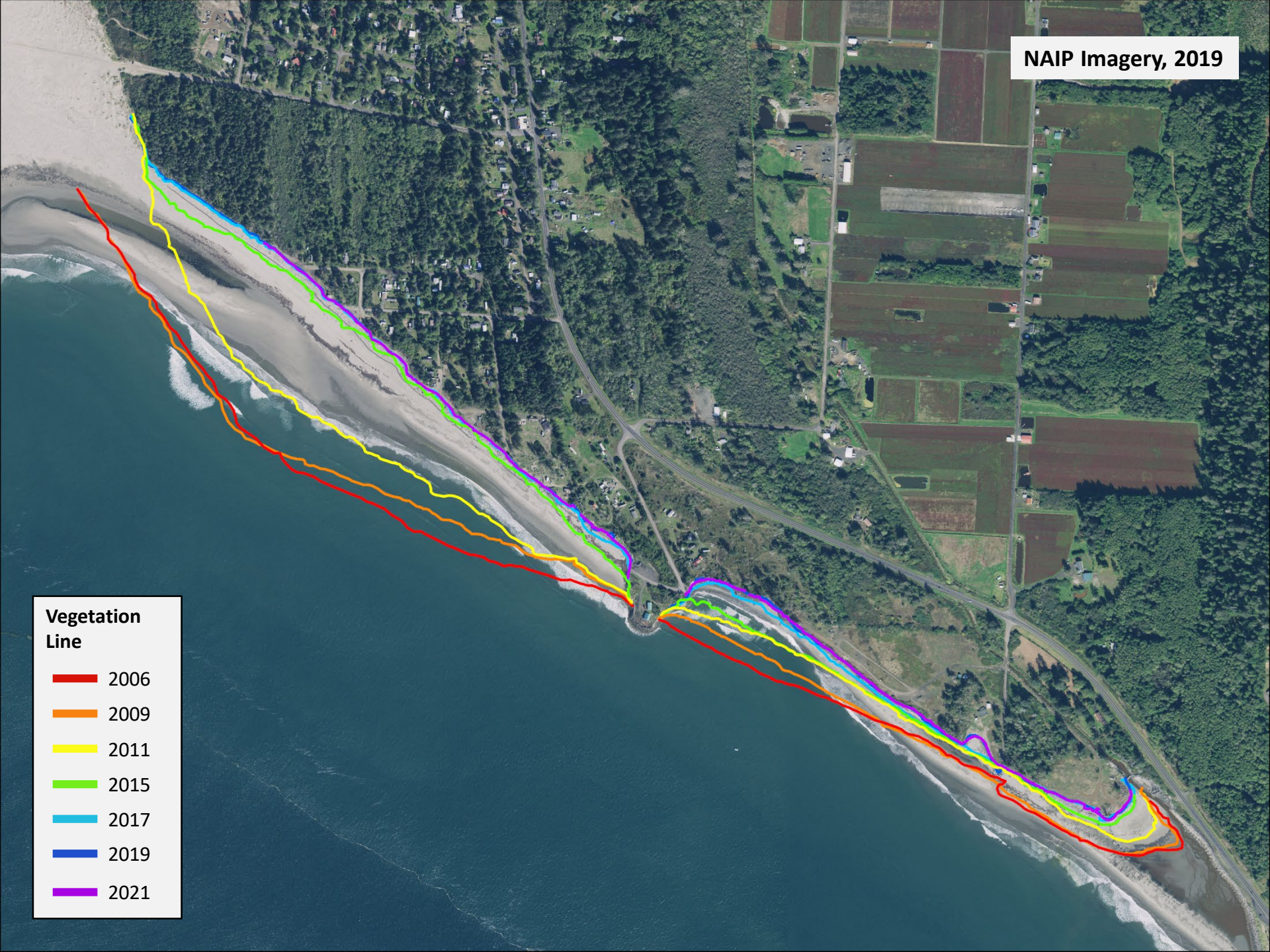
**Vegetation
Line**

- 2006
- 2009
- 2011
- 2015
- 2017
- 2019

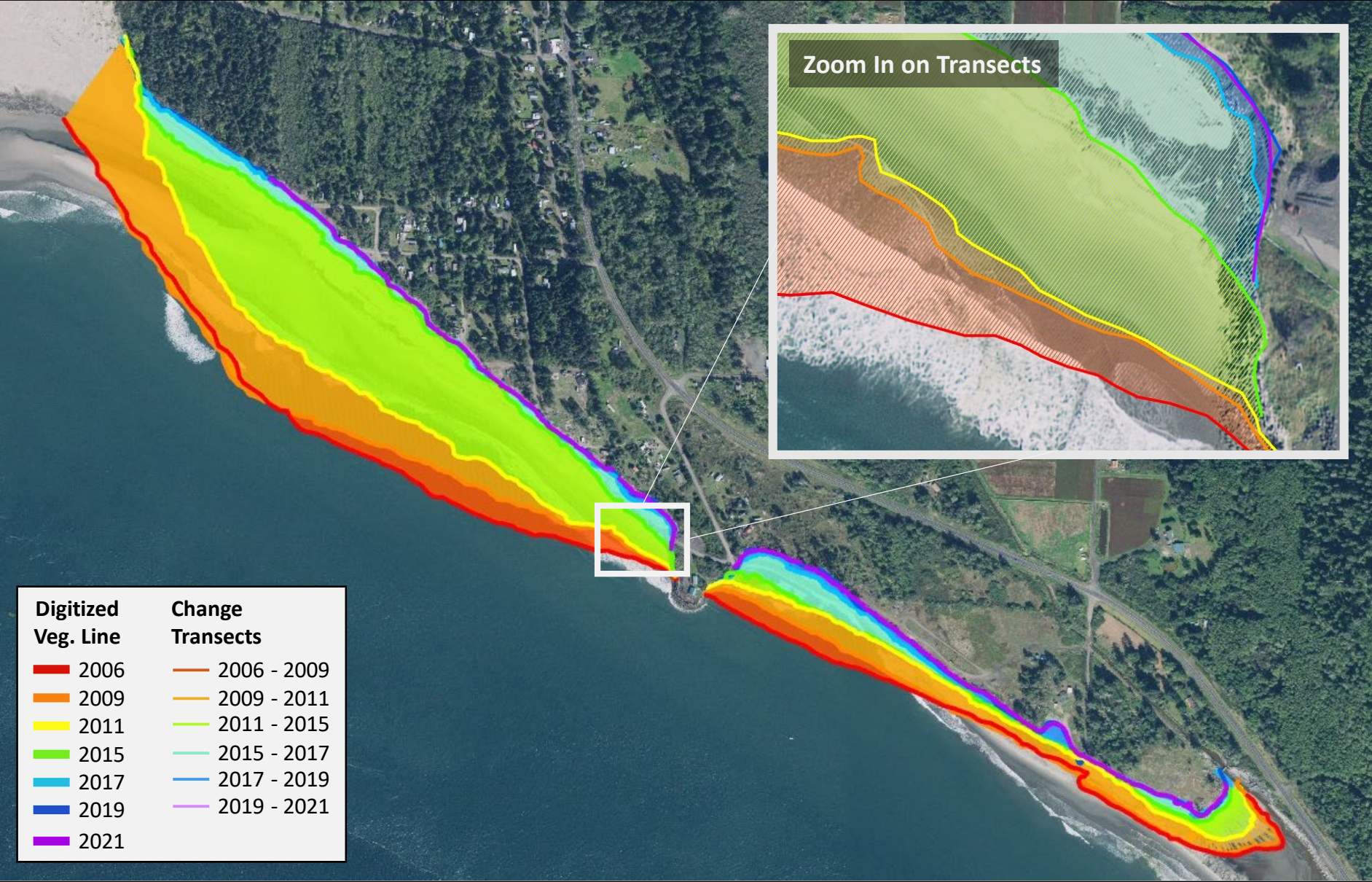


**Vegetation
Line**

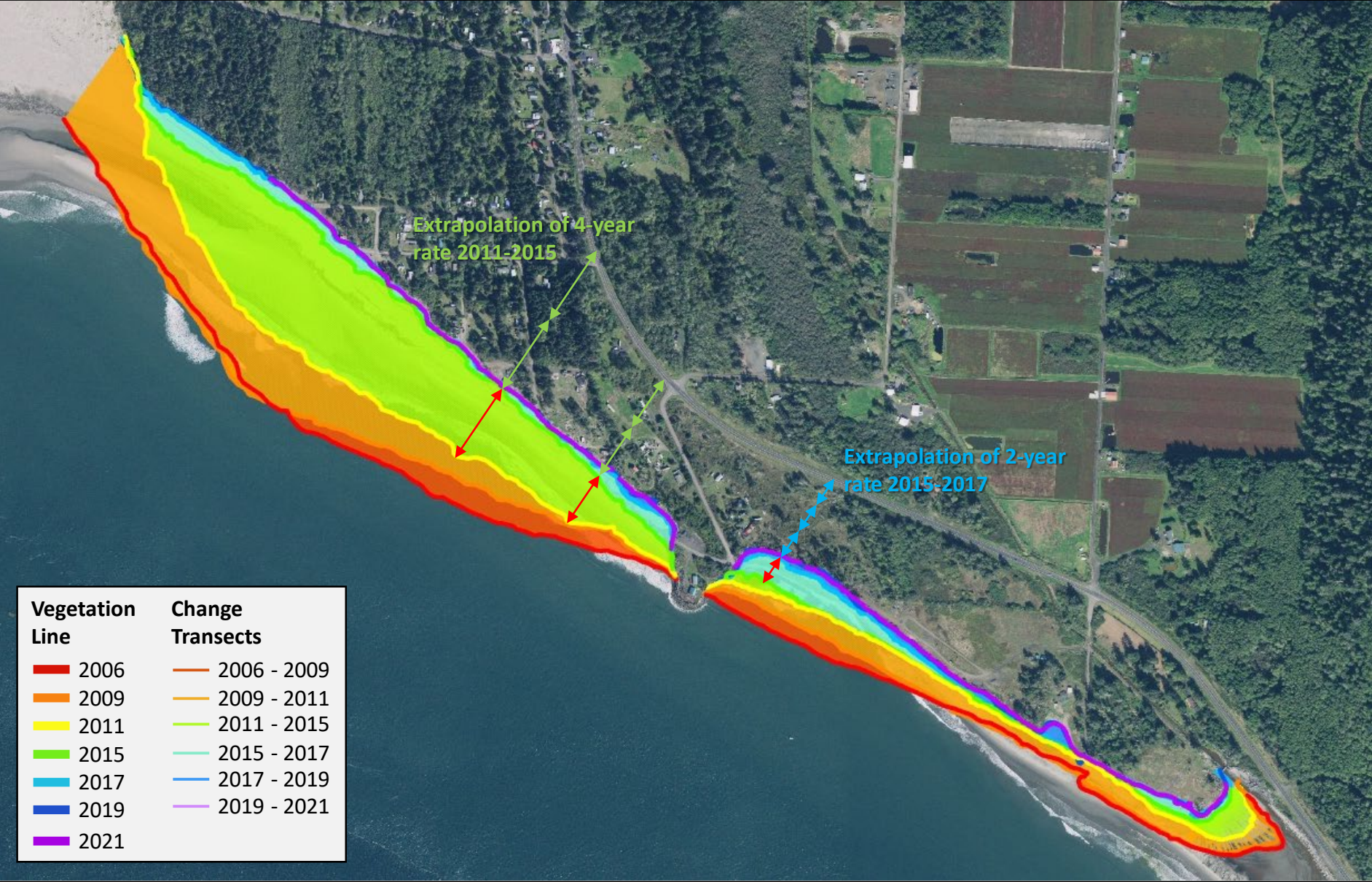
- 2006
- 2009
- 2011
- 2015
- 2017
- 2019
- 2021

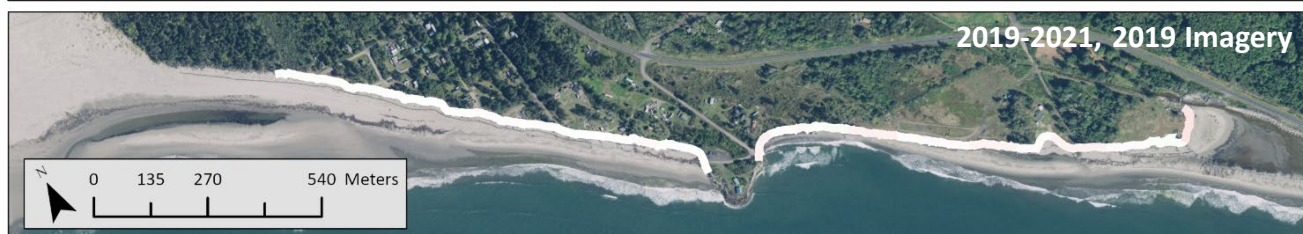


Profiles showing change between years – North Cove

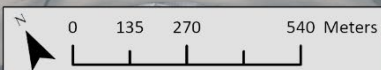
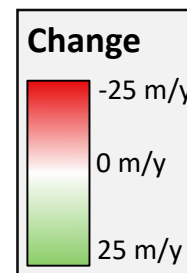


Profiles showing change between years – North Cove

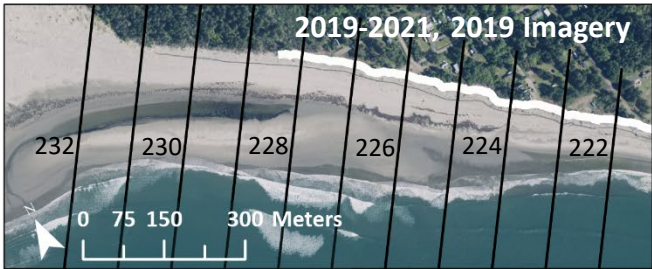
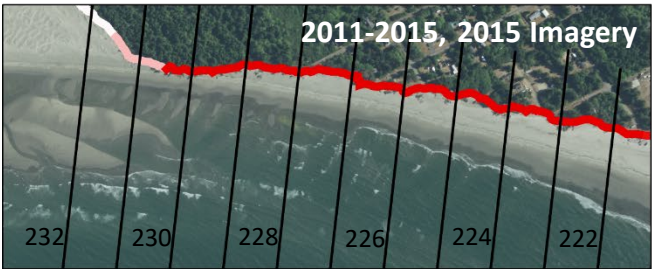
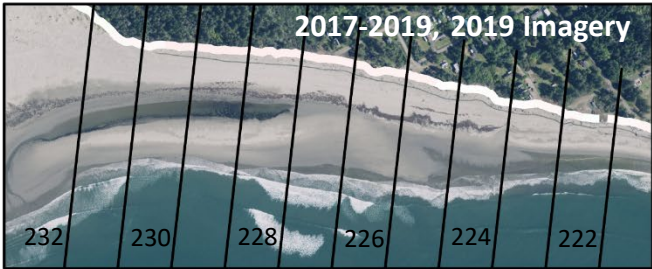
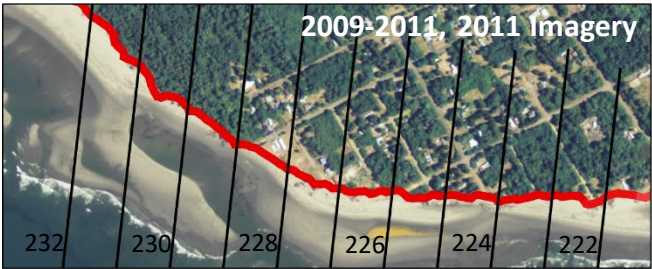
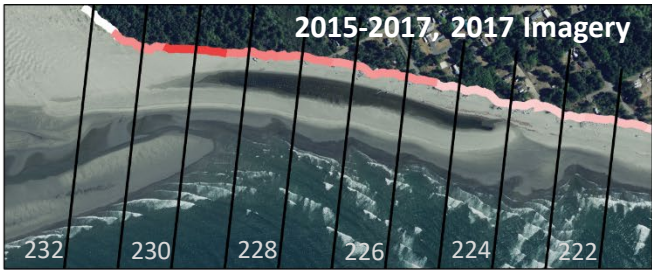




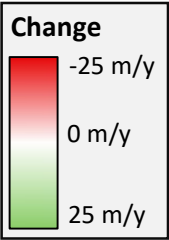
North Cove change rates based on average rates from 1 meter spaced transects



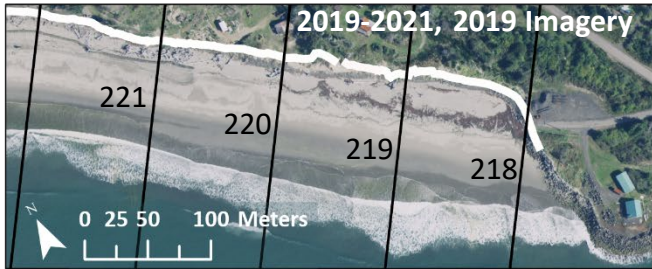
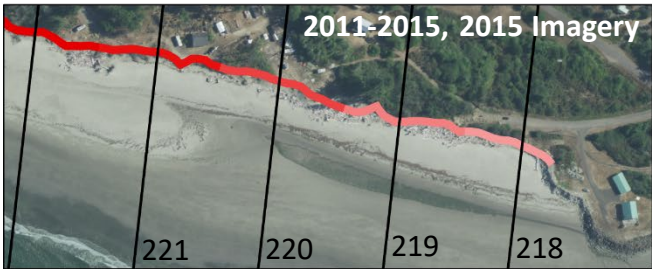
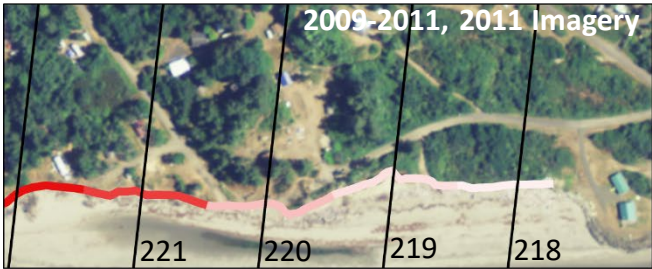
Profiles 232 – 222, Zoom In



Average Change (meters per year)	Profile	232	231	230	229	228	227	226	225	224	223	222	Avg.
	2009-2006	-0.1	0.0	2.4	3.6	3.6	4.8	1.3	-6.2	-9.4	-11.9	-16.2	-2.5
	2011-2009	-88.7	-66.1	-55.7	-48.6	-43.9	-48.2	-56.2	-47.3	-36.9	-30.6	-23.5	-49.6
	2015-2011	-0.6	-3.0	-13.2	-25.7	-39.6	-52.4	-49.1	-51.6	-46.3	-41.2	-36.3	-32.6
	2017-2015	0.2	-11.3	-18.7	-12.5	-11.8	-10.1	-10.5	-5.0	-4.5	-5.1	-6.3	-8.7
	2019-2017	1.2	-0.7	-1.6	-1.7	-1.4	-1.3	-1.2	-0.2	-0.2	-0.6	-0.6	-0.8
	2021-2019					0.4	0.5	0.7	0.2	0.1	-0.3	0.0	0.2



Profiles 221 – 218, Zoom In



Average Change (meters per year)	Profile	221	220	219	218	Avg.
	2009-2006	-15.8	-13.0	-11.9	-4.4	-11.3
	2011-2009	-19.0	-6.2	-3.1	-1.5	-7.4
	2015-2011	-28.5	-27.5	-18.0	-10.9	-21.2
	2017-2015	-4.6	-9.7	-12.1	-14.8	-10.3
	2019-2017	-1.1	-1.8	-6.2	-2.9	-3.0
	2021-2019	0.1	0.2	0.2	0.3	0.2

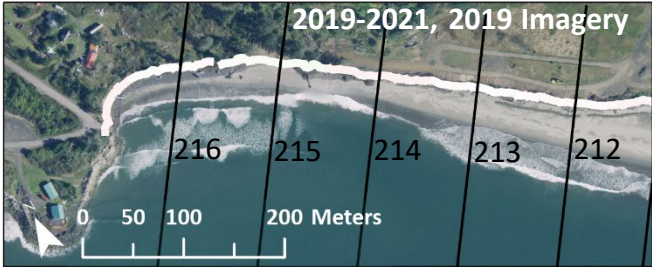
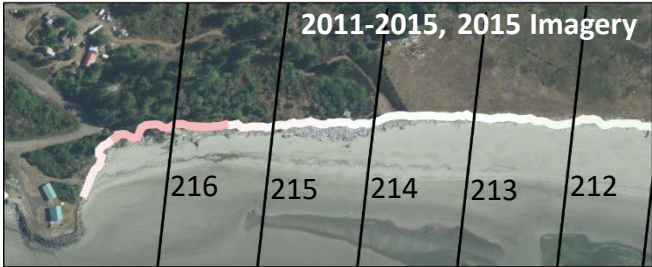
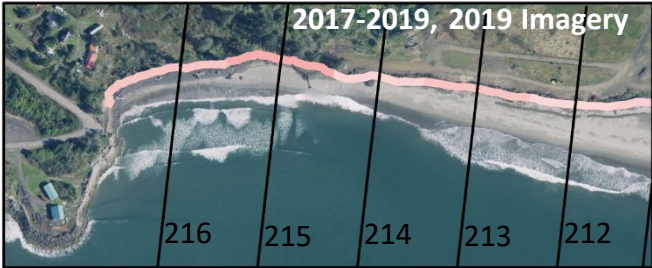
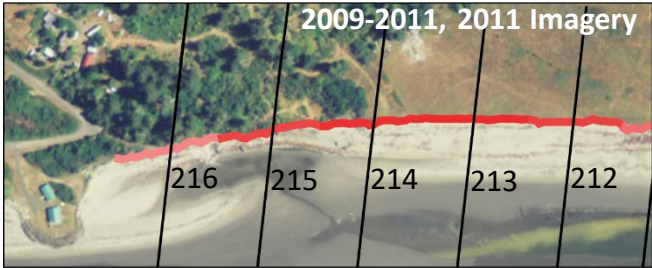
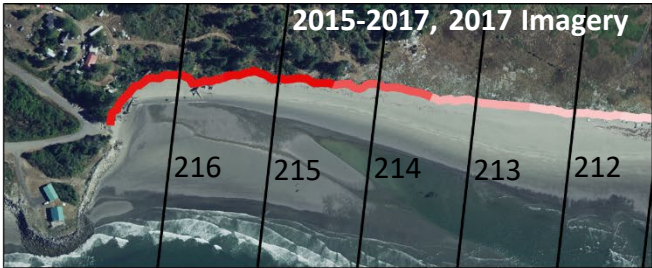
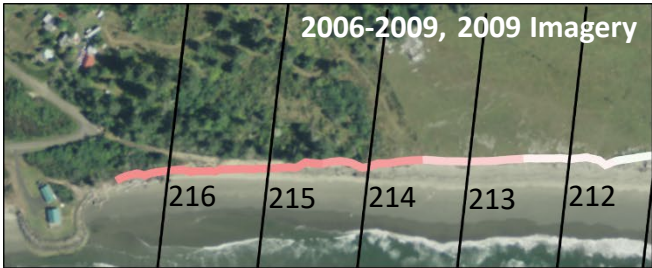
Change

-25 m/y

0 m/y

25 m/y

Profiles 216 – 212, Zoom In



Average Change (meters per year)	Profile	216	215	214	213	212	Avg.
	2009-2006	-11.1	-10.9	-9.6	-4.6	-1.4	-7.5
	2011-2009	-11.6	-18.1	-20.1	-20.4	-18.5	-17.7
	2015-2011	-5.8	-3.2	-0.4	-0.6	0.0	-2.0
	2017-2015	-22.8	-24.0	-16.6	-7.9	-5.4	-15.4
	2019-2017	-5.7	-8.0	-4.0	-5.9	-3.9	-5.5
	2021-2019	-0.1	1.4	-1.3	-0.3	-0.5	-0.2

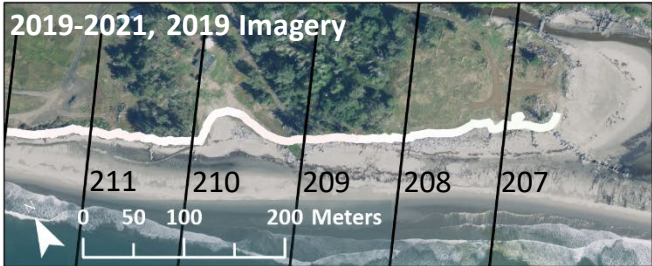
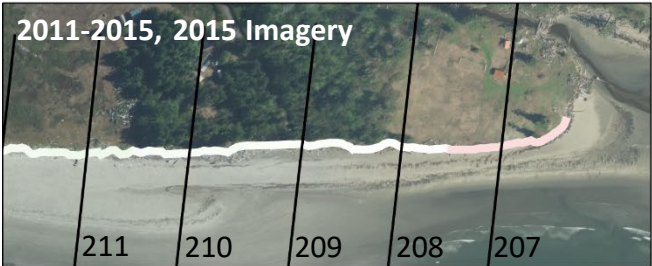
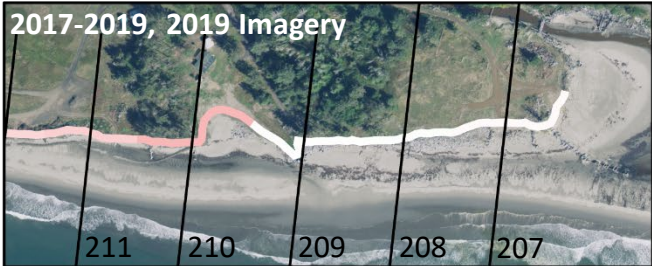
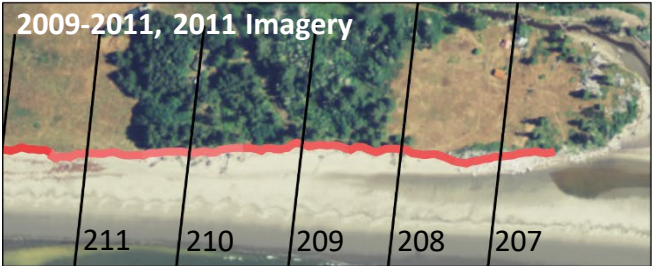
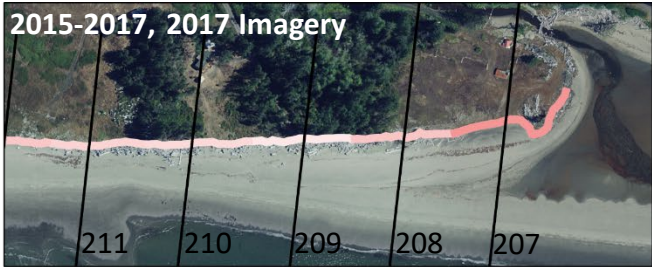
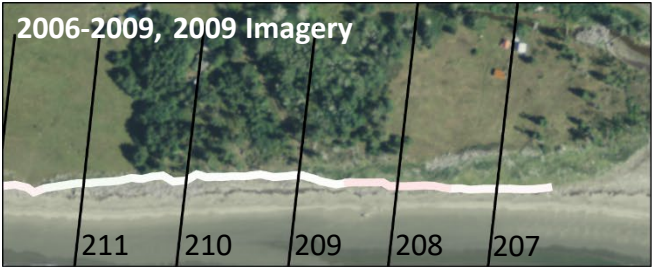
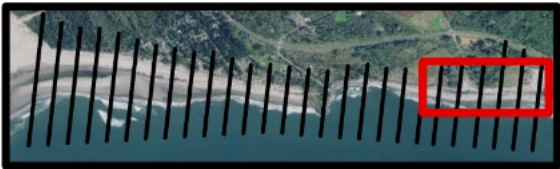
Change

-25 m/y

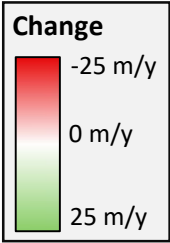
0 m/y

25 m/y

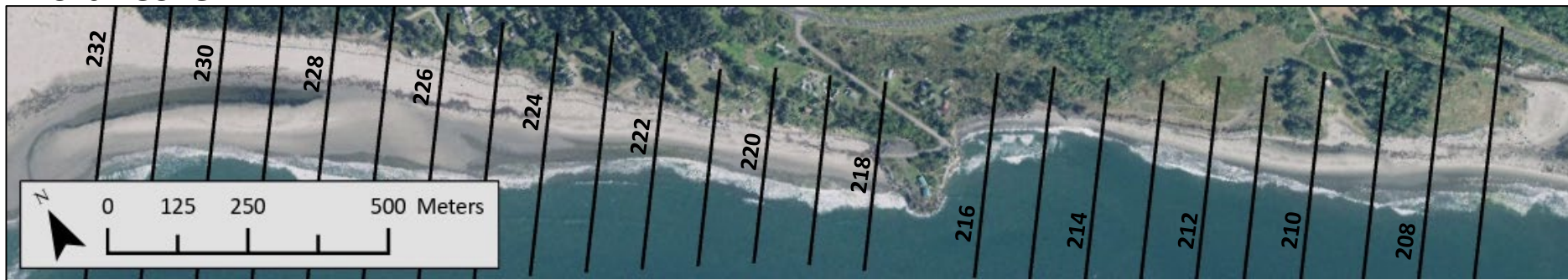
Profiles 211– 207, Zoom In



Average Change (meters per year)	Profile	211	210	209	208	207	Avg.
	2009-2006	1.8	0.9	0.4	-2.4	-0.7	0.0
	2011-2009	-14.3	-13.0	-15.6	-16.5	-16.0	-15.1
	2015-2011	-1.5	-0.9	-0.7	0.2	-2.6	-1.1
	2017-2015	-4.2	-3.7	-2.3	-5.6	-10.2	-5.2
	2019-2017	-4.7	-7.0	0.0	0.4	-0.4	-2.3
	2021-2019	-1.0	-0.3	-1.4	-0.3	1.1	-0.4



North Cove



Average Change (meters per year)	Profile	232	231	230	229	228	227	226	225	224	223	222	221	220	219	218	216	215	214	213	212	211	210	209	208	207	Avg.	Change
	2006-2009	-0.1	0.0	2.4	3.6	3.6	4.8	1.3	-6.2	-9.4	-11.9	-16.2	-15.8	-13.0	-11.9	-4.4	-11.1	-10.9	-9.6	-4.6	-1.4	1.8	0.9	0.4	-2.4	-0.7	-4.4	-25 m/y
	2009-2011	-88.7	-66.1	-55.7	-48.6	-43.9	-48.2	-56.2	-47.3	-36.9	-30.6	-23.5	-19.0	-6.2	-3.1	-1.5	-11.6	-18.1	-20.1	-20.4	-18.5	-14.3	-13.0	-15.6	-16.5	-16.0	-29.6	0 m/y
	2011-2015	-0.6	-3.0	-13.2	-25.7	-39.6	-52.4	-49.1	-51.6	-46.3	-41.2	-36.3	-28.5	-27.5	-18.0	-10.9	-5.8	-3.2	-0.4	-0.6	0.0	-1.5	-0.9	-0.7	0.2	-2.6	-18.4	25 m/y
	2015-2017	0.2	-11.3	-18.7	-12.5	-11.8	-10.1	-10.5	-5.0	-4.5	-5.1	-6.3	-4.6	-9.7	-12.1	-14.8	-22.8	-24.0	-16.6	-7.9	-5.4	-4.2	-3.7	-2.3	-5.6	-10.2	-9.6	
	2017-2019	1.2	-0.7	-1.6	-1.7	-1.4	-1.3	-1.2	-0.2	-0.2	-0.6	-0.6	-1.1	-1.8	-6.2	-2.9	-5.7	-8.0	-4.0	-5.9	-3.9	-4.7	-7.0	0.0	0.4	-0.4	-2.4	
	2019-2021					0.4	0.5	0.7	0.2	0.1	-0.3	0.0	0.1	0.2	0.2	0.3	-0.1	1.4	-1.3	-0.3	-0.5	-1.0	-0.3	-1.4	-0.3	1.1	0.0	

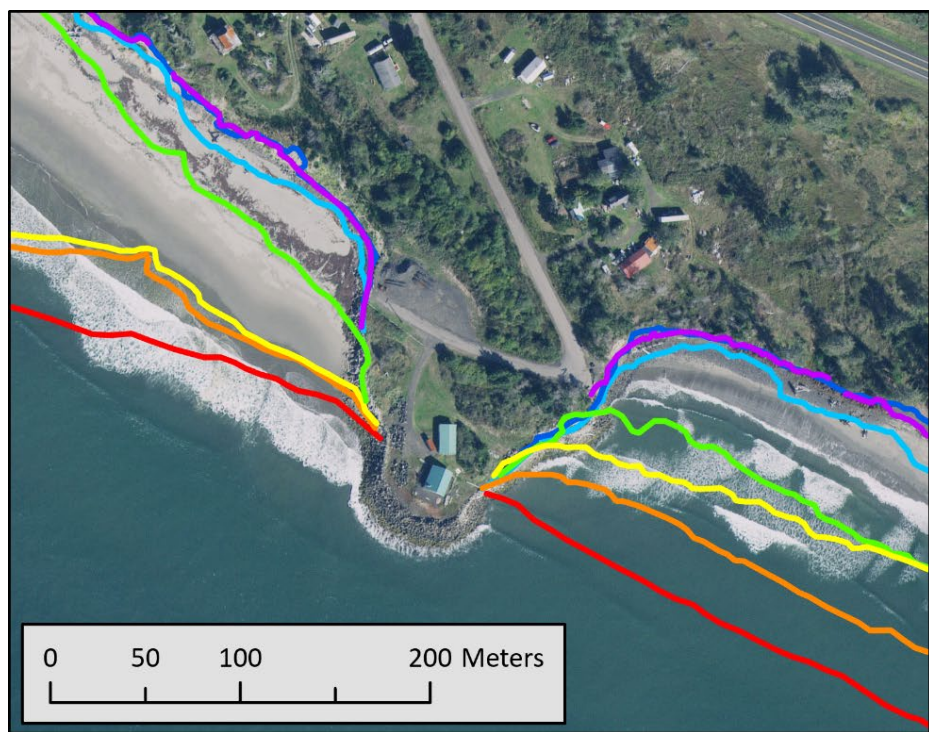
Westport



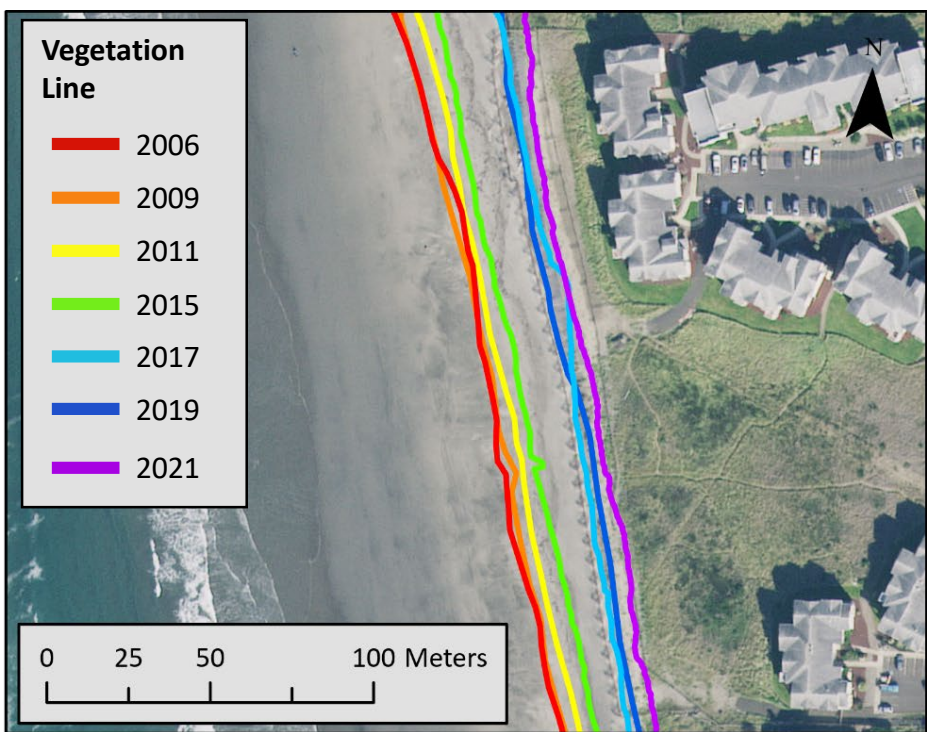
Average Change (meters per year)	Profile	87	86.5	86	85.5	85	84.5	84	83.5	83	82.5	82	81.5	81	80.5	80	79.5	79	78.5	78	Avg.	Change
	2006-2009	-2.5	-2.0	-1.3	-0.1	0.0	-0.4	-1.1	-0.2	-1.5	-1.8	-1.2	-1.5	-1.4	-1.2	-0.8	-1.3	-0.9	-0.1	-0.4	-1.0	-5 m/y
	2009-2011	-0.9	-2.0	-1.9	-3.0	-1.8	-1.9	-1.3	-1.9	-2.6	-3.4	-3.3	-3.7	-3.2	-3.0	-2.4	-1.0	-0.9	-0.9	-1.0	-2.1	0 m/y
	2011-2015	-1.5	-2.0	-2.7	-1.9	-1.1	-1.2	-1.0	-0.8	-0.5	-0.5	-0.7	-0.5	-0.5	-0.4	-0.9	-0.5	-0.1	-0.8	-1.3	-1.0	5 m/y
	2015-2017	-7.7	-7.4	-8.5	-8.7	-8.6	-5.5	-3.8	-4.9	-5.0	-3.8	-2.8	-2.4	-3.8	-4.7	-4.2	-3.6	-3.6	-3.7	-4.1	-5.1	
	2017-2019	-1.1	-1.9	-1.0	-0.6	0.7	-1.3	-1.3	-1.2	-1.3	-1.1	-1.4	-1.3	-0.8	-0.6	-0.8	-0.9	-1.0	-0.7	-0.7	-1.0	
	2019-2021	-1.7	-2.8	-3.1	-3.6	-2.7	-2.5	-2.9	-2.5	-2.9	-2.7	-2.3	-1.6	-1.1	-1.0	-0.7	-1.9	-2.2	-2.2	-1.7	-2.2	

Comparison between North Cove and Westport

North Cove



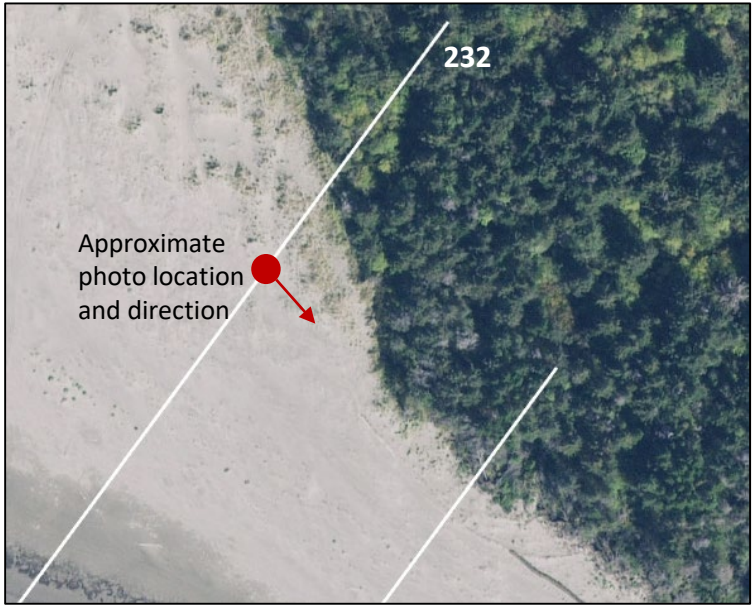
Westport



Location		North Cove	Westport
Number of Profiles		2415	1978
Average Change (meters per year)	2006-2009	-4.4	-1.0
	2009-2011	-29.6	-2.1
	2011-2015	-18.4	-1.0
	2015-2017	-9.6	-5.1
	2017-2019	-2.4	-1.0
	2019-2021	0.0	-2.2

North Cove Average: -12.9 m/y
Westport Average: -2.0 m/y
10x reduction vs. 2x increase

Profile 232, Photo Comparison between 2019 and 2021 surveys



Profile 229, Photo Comparison between 2019 and 2021 surveys



Conclusions

- No upland retreat following 2018 project
- Contrasts with continued retreat at Westport
 - 10x reduction vs no reduction in retreat rate
- Driftwood and wrack accumulation on backshore zone
- Dune and vegetation growth seaward of dynamic revetment at western and eastern ends
 - Substantial increase in coastal habitat
- Dynamic stability along central sections
- Increase in coastal resilience