MONITORING COASTAL SALT MARSHES IN THE SOUTHWEST ALASKA NETWORK

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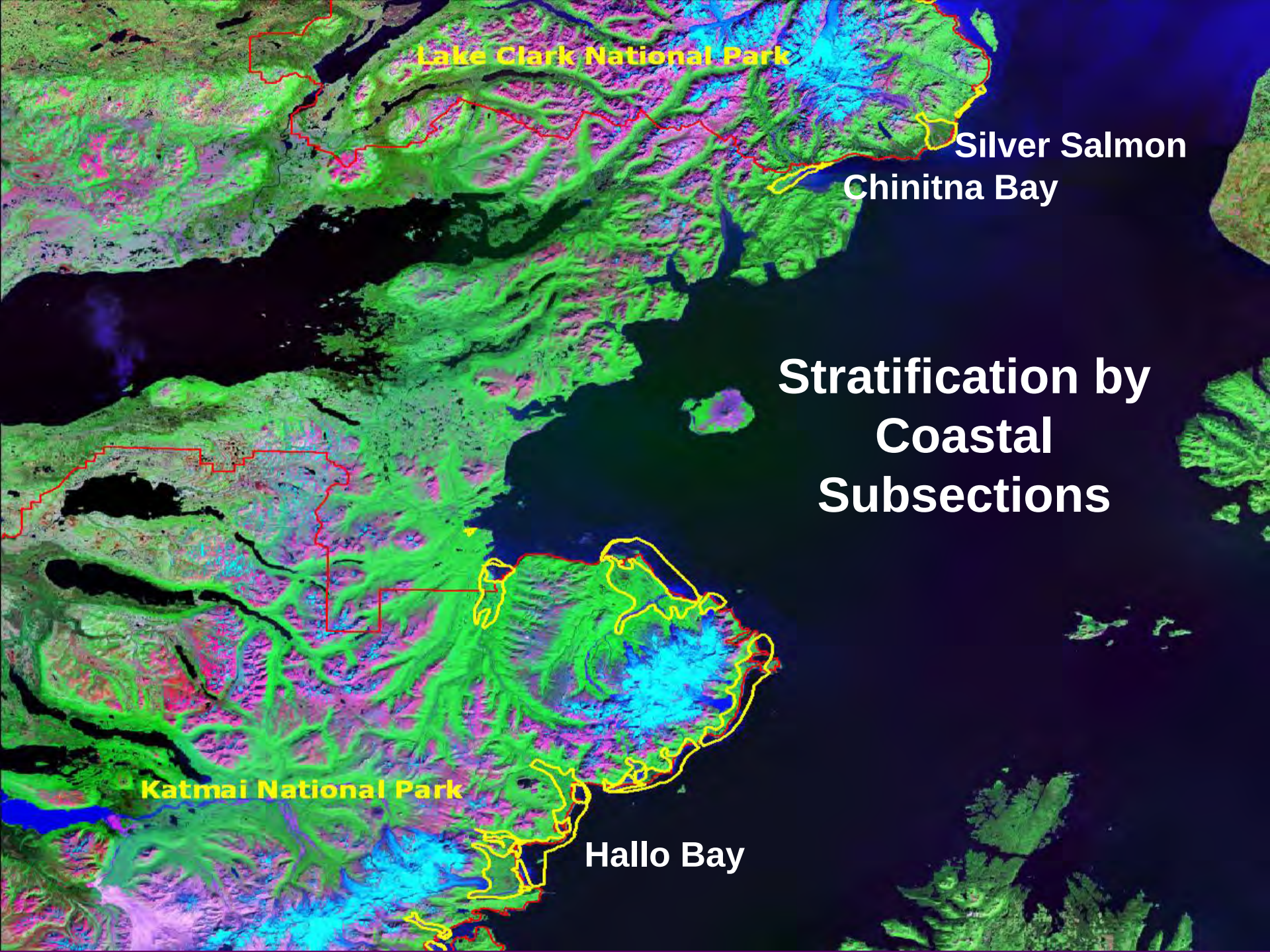
Accomplishments

- Two years of fieldwork completed
- Database nearly complete
- Data summary nearly complete
- Remote sensing nearly complete
- Protocols nearly finalization
- Some issues still outstanding
- Manuscript development


Lake Clark National Park
Silver Salmon
Chinitna Bay
Stratification by Coastal Subsections
Katmai National Park
Hallo Bay

Coastal Monitoring Parameters

Physical
Topography/Bathymetry (T)
Shoreline position (R)
Waterbody coverage (R)
Water level/Storms (P)
Sedimentation rates (P)
Chemical
Water pH (P)
Water Salinity (P)

Biological
Acreage of ecosystem type (R)
Plant cover and frequency (P)
Plant community composition (P)
Frequency of indicator/exotic species (P)
Herbivory from bears and geese (P)
Woody debris (tidally-deposited) (T)
Anthropogenic
Trash (T)
Camp-sites and trail (GM)

R= remote sensing, T = transect, P = plot, GM = GPS ground mapping

Access Database

Microsoft Access - [SWAN_Coastal_Database : Database (Access 2000 file format)]

File Edit View Insert Tools Window Help

Open Design New

Objects: Tables, Queries, Forms, Reports, Pages, Macros, Modules

Name	Description	Modified	Created	Type
REF_Mottle_Contrst	Soil form ref table	11/22/2006 4:03:4...	11/16/2005 3:15:2...	Table
REF_Mottle_Size	Soil form ref table	11/22/2006 4:04:0...	11/16/2005 3:15:2...	Table
REF_NWIWaterRegimeCodes	Reference Table for NWI Water Regime codes in tbl_ELS_Plot_Data	11/22/2006 4:19:0...	11/16/2005 3:15:2...	Table
REF_Peat	Soil form ref table	11/22/2006 4:04:1...	11/16/2005 3:15:2...	Table
REF_PhysiographyCodes	Reference Table for Physiography Codes in tbl_ELS_Plot_Data	11/22/2006 4:14:3...	11/16/2005 3:15:2...	Table
REF_Redox_Type	Reference Table for soil variable	11/16/2005 3:20:2...	11/16/2005 3:15:2...	Table
REF_Rupture_Resist_Block	Soil form ref table	11/22/2006 4:04:2...	11/16/2005 3:15:2...	Table
REF_SampleMeth	Reference table for Sample Method codes in tbl_ELS_Plot_Data	11/30/2006 2:51:5...	11/16/2005 3:15:2...	Table
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REF_Soil_Sticki		11/16/2005 3:20:2...	11/16/2005 3:15:2...	Table
REF_Soil_Structure	Soil form ref table	11/22/2006 4:05:3...	11/16/2005 3:15:2...	Table
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REF_vegTaxonomy	Reference floristic taxonomy	2/17/2009 12:06:1...	9/24/2007 10:15:0...	Table
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tbl_image_software	Photo viewer table	11/16/2005 3:27:3...	11/16/2005 3:27:3...	Table
tbl_parent	Photo viewer table	11/28/2006 3:11:0...	11/18/2005 10:02:...	Table
tbl_soil_stratigraphy	Soil stratigraphy description	3/27/2009 2:15:01 PM	11/16/2005 3:21:3...	Table
tbl_topography	Topography data imported from intermediate Excel file used to calculate elevations al...	3/27/2009 2:15:42 PM	3/26/2009 2:00:46 PM	Table
tbl_Veg_Classification		3/27/2009 4:27:33 PM	1/2/2009 9:07:06 PM	Table
tbl_Veg_Cover_summed_by_plot_with_all_species		2/17/2009 5:20:55 PM	2/17/2009 11:35:3...	Table
tbl_Veg_Pt_Sample_Data	Multi-year point sampling data of Vegetation	3/27/2009 2:17:18 PM	12/4/2008 10:44:1...	Table
tbl-Water_Level	Water level, water temperature, barometric pressure, air temperature	3/29/2009 5:05:10 PM	3/28/2009 4:26:23 PM	Table
xref_image_parent	Photo viewer table	4/21/2008 11:34:2...	11/1/2006 9:30:30 ...	Table

Groups

Ready NUM

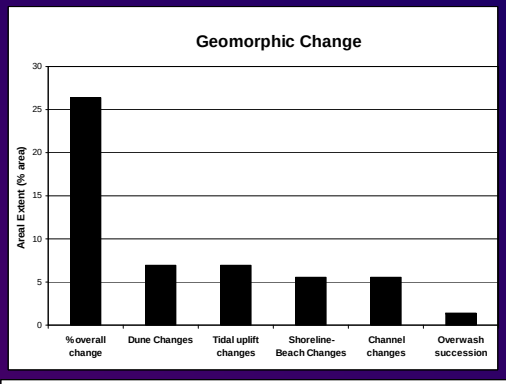
start | Data | 2009_SWAN_Coa... | 2007_SWAN_Coa... | Microsoft Excel - ... | Table X Veg Cove... | Microsoft Access -... | (0:14) | 10:15 PM

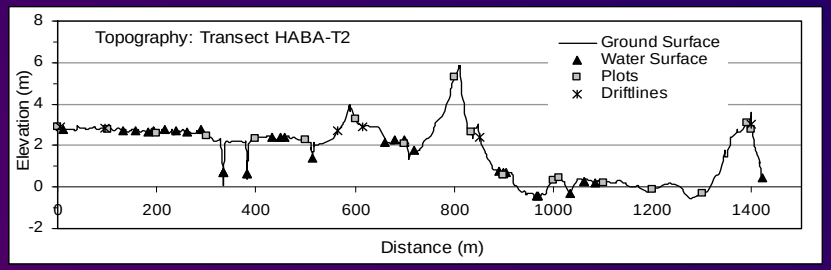
Data Summary from Access Database

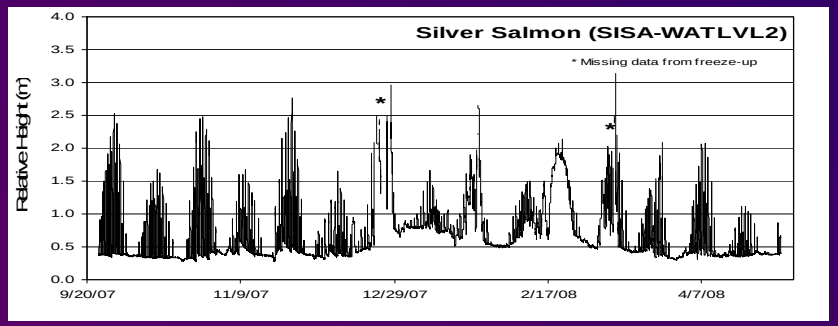
Microsoft Excel - SWAN All Data Summary.xls

Plot Environment		Soil Stratigraphy		Vegetation Points		Topography		Water Level		Soil Temperature	
154 Sites		25 Profiles		130 Plots		10/12 Transects		3 Water + 1 Baro		4 Dataloggers	
Count of SiteID		Count of SiteID_Year		Count of SiteID_Yea		Count of TransID		Count of SiteID		Count of SiteID	
SiteID	Total	SiteID_Year	Total	SiteID_Year	Total	TransID	Total	SiteID	Total	SiteID	Total
CHBA-ST1	1	CHBA_T4_300_2007	11	CHBA-T1-041-2007	198	CHBA-T3	125	CHBA-WL1	33544	CHBA_T2_276	558
CHBA-ST2	1	CHBA_T4_350_2007	1	CHBA-T1-100-2007	251	CHBA-T4	181	SISA-BARO	36142	CHBA_T2_300	558
CHBA-T1-0	1	CHBA_T4_500_2007	1	CHBA-T1-200-2007	216	HABA-T1	278	SISA-WL1	35729	SISA_T2_100	565
CHBA-T1-041	1	HABA_T2_100_2008	6	CHBA-T1-258-2007	332	HABA-T2	450	SISA-WL2	36025	SISA_T2_500	565
CHBA-T1-100	1	HABA_T2_1000_2008	4	CHBA-T1-300-2007	224	HABA-T3	337	Grand Total	141440	Grand Total	2248
CHBA-T1-200	1	HABA_T2_1012_2008	4	CHBA-T1-385-2007	143	HABA-T4	183				
CHBA-T1-258	1	HABA_T2_1100_2008	1	CHBA-T1-400-2007	197	SISA-T1	345				
CHBA-T1-300	1	HABA_T2_200_2008	5	CHBA-T1-500-2007	174	SISA-T2	119				
CHBA-T1-385	1	HABA_T2_300_2008	6	CHBA-T1-600-2007	275	SISA-T3	135				
CHBA-T1-400	1	HABA_T2_400_2008	5	CHBA-T1-646-2007	294	SISA-T4	136				
CHBA-T1-500	1	HABA_T2_500_2008	6	CHBA-T1-653-2007	124	Grand Total	2289				
CHBA-T1-600	1	HABA_T2_600_2008	7	CHBA-T1-700-2007	100						
CHBA-T1-646	1	HABA_T2_700_2008	6	CHBA-T2-025-2007	203						
CHBA-T1-653	1	HABA_T2_800_2008	8	CHBA-T2-100-2007	180						
CHBA-T1-700	1	HABA_T2_830_2008	6	CHBA-T2-155-2007	270						
CHBA-T2-0	1	HABA_T2_900_2008	3	CHBA-T2-200-2007	299						
CHBA-T2-025	1	HABA_T3_088_2008	7	CHBA-T2-276-2007	267						
CHBA-T2-100	1	HABA_T3_100_2008	2	CHBA-T2-300-2007	430						
CHBA-T2-155	1	HABA_T3_200_2008	7	CHBA-T2-373-2007	399						
CHBA-T2-200	1	HABA_T3_400_2008	7	CHBA-T2-390-2007	189						
CHBA-T2-276	1	HABA_T3_500_2008	2	CHBA-T2-400-2007	103						
CHBA-T2-300	1	HABA_T3_800_2008	5	CHBA-T3-011-2007	176						
CHBA-T2-373	1	HABA_T4_230_2008	6	CHBA-T3-086-2007	172						
CHBA-T2-390	1	SISA_T1_600_2007	23	CHBA-T3-100-2007	230						

Still need to resolve issue with water level data


Geomorphic Change
Areal Extent (% area)
30
25
20
15
10
5
0
% overall change
Dune Changes
Tidal uplift changes
Shoreline-Beach Changes
Channel changes
Overwash succession


Topography: Transect HABA-T2
Ground Surface
Water Surface
Plots
Driftlines
Elevation (m)
8
6
4
2
0
-2
0
200
400
600
800
1000
1200
1400
Distance (m)


Silver Salmon (SISA-WATLVL2)
* Missing data from freeze-up
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
9/20/07
11/9/07
12/29/07
2/17/08
4/7/08

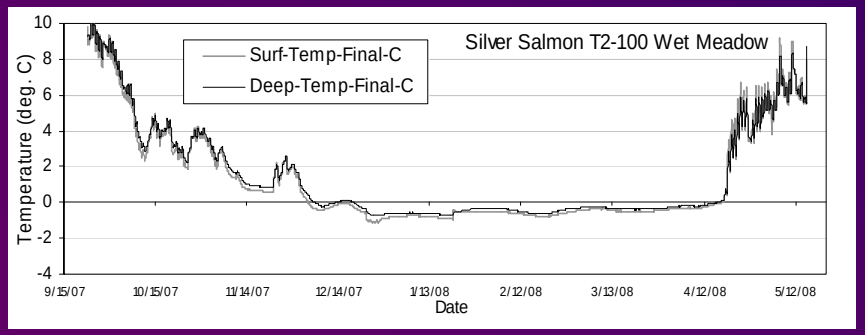
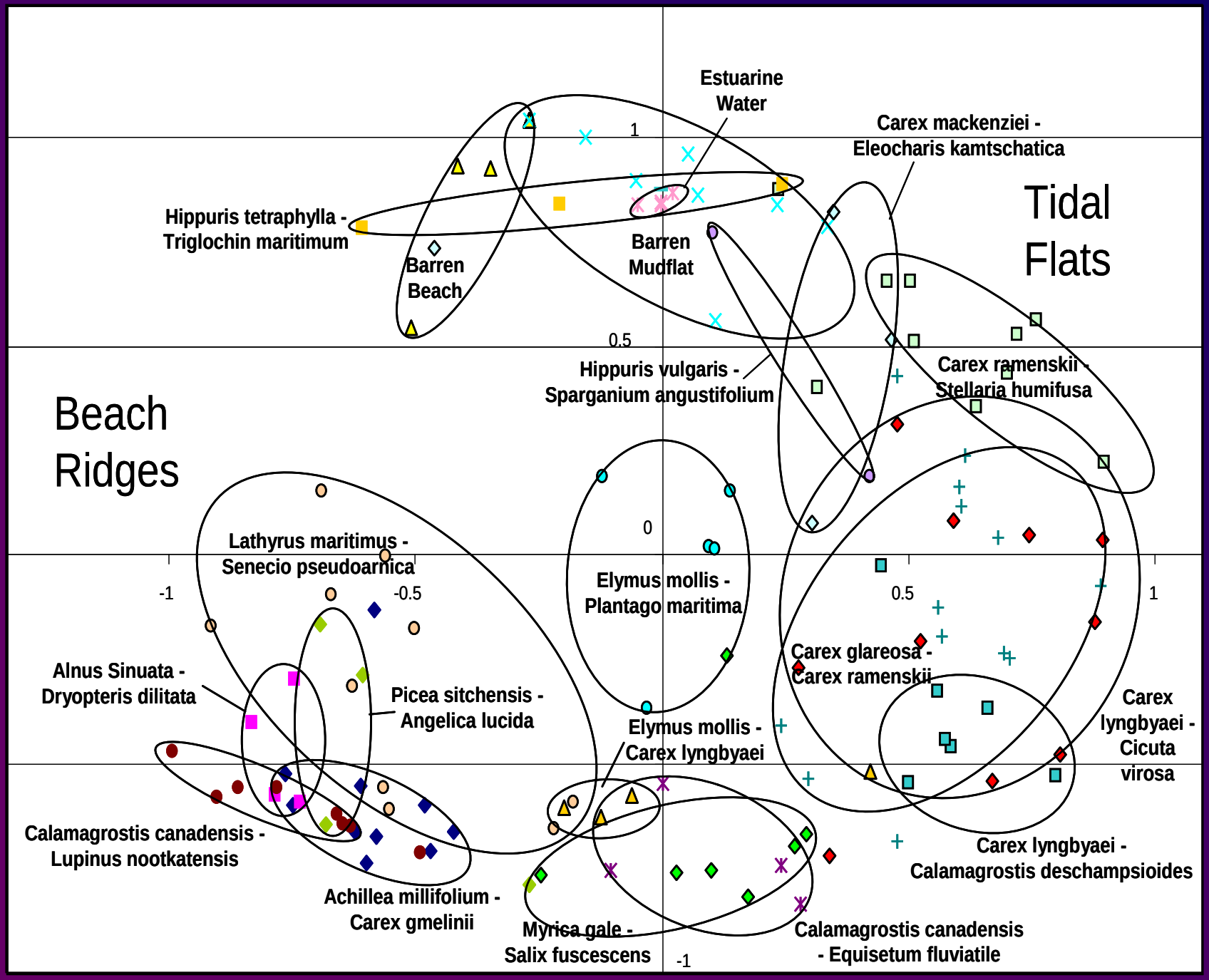

Silver Salmon T2-100 Wet Meadow
Surf-Temp-Final-C
Deep-Temp-Final-C
Temperature (deg. C)
10
8
6
4
2
0
-2
-4
9/15/07
10/15/07
11/14/07
12/14/07
1/13/08
2/12/08
3/13/08
4/12/08
5/12/08
Date

Table X. Mean plant cover (%) and 90% confidence interval (CI) for three coastal areas in SWAN based on systematically distributed plots.

	Chinitna Bay (20)		Hallo Bay (35)		Silver Salmon (23)		Overall (n=78)	
SpeciesName	Mean	CI	Mean	CI	Mean	CI	Mean	CI
Picea sitchensis	2.5	1.9	0.1	0.2	1.1	1.0	1.1	0.7
Evergreen Tree Total	**2.5**	**1.9**	**0.1**	**0.2**	**1.1**	**1.0**	**1.1**	**0.7**
Betula papyrifera var. kenaica	0.2	0.2	0.4	0.4			0.2	0.2
Deciduous Tree Total	**0.2**	**0.2**	**0.4**	**0.4**			**0.2**	**0.2**
Empetrum nigrum			0.0	0.0			0.0	0.0
Vaccinium vitis-idaea			0.1	0.1			0.0	0.1
Evergreen Shrubs Total			**0.1**	**0.1**			**0.0**	**0.0**
Alnus sinuata	2.1	3.4	4.2	4.0			2.3	1.9
Betula nana	0.2	0.2	0.4	0.6			0.2	0.3
Ribes laxiflorum	0.3	0.5					0.1	0.2
Ribes triste	0.2	0.3					0.1	0.1
Salix barclayi	0.0	0.0	1.4	1.6			0.6	0.7
Salix fuscescens	6.4	5.0	4.6	3.8			3.8	2.2
Salix planifolia pulchra	1.5	2.4	0.7	1.1			0.7	0.9
Salix sp.	0.1	0.2					0.0	0.1
Sambucus racemosa	0.0	0.0	0.1	0.1			0.0	0.1
Viburnum edule	0.2	0.3	0.4	0.6			0.2	0.3
Oplopanax horridus	0.6	1.0					0.2	0.3
Myrica gale	4.7	4.8	8.2	5.0			4.8	2.5
Deciduous Shrubs Total	**1.4**	**0.7**	**1.7**	**0.7**			**1.1**	**0.3**
Achillea millefolium	7.9	4.8	5.8	2.5	14.2	9.3	8.9	3.2
Angelica genuflexa	0.5	0.8					0.1	0.2
Angelica lucida	2.0	1.3	2.3	1.6	8.1	5.3	3.9	1.8
Athyrium filix-femina cyclosorum			0.8	1.3			0.3	0.5
Atriplex gmelini			0.1	0.1			0.0	0.0

Table X. Mean cover (%, includes multiple layers) of plant species on coastal flats within SWAN Species with a frequency of >70% within class are bolded, dominant and differential species for identifying community are underlined, and zeroes represent trace species.

Species or Cover	Barren Mudflat	Carex ramenskii-Plantago maritima	Carex glareosa-Carex ramenskii	Elymus mollis-Plantago maritima	Elymus mollis-Carex lyngbyaei	Carex lyngbyaei-C. deschampsioides	Carex lyngbyaei-Cicuta virosa	Myrica gale-Salix fuscescens	C. canadensis-Equisetum	Carex mackenziei-Eleocharis	Hippuris tetraphylla	Hippuris vulgaris-Sparganium	Estuarine Water	River	Overall
Bare Soil	**6**	**11**	4	4		0	2	0	0	1	6				9
Honckenya peploides	3														0
Puccinellia pumila	3														0
Puccinellia nutkaensis	9	3		0											1
Puccinellia phryganodes	1	6	1	3									0		3
Plantago maritima	1	***18***	6	***16***			0								5
Triglochin maritimum	2	**18**	**13**	5	1	3	0			1	**2**				5
Carex ramenskii	0	***79***	***27***	6		5	0			9	2				15
Potentilla egedii	2	**13**	**18**	**15**	17	**9**	1	0		1					7
Stellaria humifusa	1	**9**	2	0			0								1
Triglochin palustris		1	3	1		3	0			0					1
Deschampsia beringensis	0		1	1		1	1	0		0					0
Poa eminens		2	**15**	1	6	**8**	0	0		0					4
Carex glareosa			***53***	1	2	**6**	0	1							9
Calamagrostis deschampsioides		1	**12**		0	***16***	4	1	0	5					4
Chrysanthemum arcticum	0		**5**	**7**	2	**3**	0			1					2
Festuca rubra	0		**15**	7	**10**	**8**		1	2						4
Lathyrus maritimus	0		1	7	**8**			0							1
Elymus arenarius mollis	0	1	1	***70***	***75***	4									8
Ligusticum scoticum			0	4	**4**	1		1		0					1
Hordeum brachyantherum					**22**										1
Achillea millefolium					**19**	0	0	2	0						1
Conioselinum chinense					**5**	0		4							1
Angelica lucida			0		**4**			0							0
Stellaria crassifolia			0	2	4	1			1						0
Hierochloe odorata					3				2						0
Trientalis europaea					2	1	0	1	0						0
Cicuta virosa						1	*6*		0			0			1
Galium trifidum trifidum			0		0	**2**	**2**	0	0						0
Carex lyngbyaei	0		3	0	***39***	***89***	***128***	**20**	**15**	10		8			28
Calamagrostis canadensis					**21**	0	8	**44**	***26***	0					7
Myrica gale						10	0	**72**	1	1		10			7
Salix fuscescens						15	0	***45***	19						6
Potentilla palustris						0	1	**10**	**9**	1					1
Unknown moss			2		1	19	9	4	**29**	0					5
Carex pluriflora			2		0	4	0	13	**18**	2					3
Epilobium palustre			0			0	2	1	**2**	0					0


Estuarine Water
Carex mackenziei - Eleocharis kamtschatica
Tidal Flats
Hippuris tetraphylla - Triglochin maritimum
Barren Beach
Barren Mudflat
Hippuris vulgaris - Sparganium angustifolium
Carex ramenskii - Stellaria humifusa
Beach Ridges
Lathyrus maritimus - Senecio pseudoarnica
Elymus mollis - Plantago maritima
Carex glareosa - Carex ramenskii
Alnus Sinuata - Dryopteris dilitata
Picea sitchensis - Angelica lucida
Elymus mollis - Carex lyngbyaei
Carex lyngbyaei - Cicuta virosa
Calamagrostis canadensis - Lupinus nootkatensis
Carex lyngbyaei - Calamagrostis deschampsioides
Achillea millifolium - Carex gmelinii
Myrica gale - Salix fuscescens
Calamagrostis canadensis - Equisetum fluviatile
1
0.5
0
-1
-0.5
0.5
1
-1

PLOTID	StudyArea	Achillea_millefolium	Agrostis_scabra	Alnus_sinuata	Angelica_genuflexa	Angelica_lucida	Athyrium_filix-femin	Aulacomnium_palu	Bare_Soil	Betula_nana	Betula_papyrifera_	Calamagrostis_can
PLOTID	StudyArea	Achille	Agrost	Alnus_	Angelic	Ange	Athyriu	Aulaco	Bare_S	Betula_	Betula_	Calam
Mean		9.5	0.0	2.6	0.2	3.9	0.4	0.0	13.2	0.2	0.2	8.7
SD		23.5	0.46	14.1	1.757	13	3.79	0.332	29.36	1.909	1.346	18.8
Count		117	117	117	117	117	117	117	117	117	117	117
Variance		554	0.21	198	3.085	161	14.4	0.11	862.1	3.644	1.812	355
Confidence 95%		4.27	0.08	2.55	0.318	2.3	0.69	0.06	5.32	0.346	0.244	3.41
Confidence 90%		3.58	0.07	2.14	0.267	1.9	0.58	0.05	4.465	0.29	0.205	2.86
Sample Size calculation for all sites												
uncorrected sample size estimate (n)		409	7867	2025	7867	720	7163	4058	333.7	4567	2468	314
SD		23.5	0.46	14.1	1.757	13	3.79	0.332	29.36	1.909	1.346	18.8
standard normal coefficient=1.64		1.64	1.64	1.64	1.64	1.6	1.64	1.64	1.64	1.64	1.64	1.64
precision 20% of sample mean		1.91	0.01	0.51	0.032	0.8	0.07	0.009	2.636	0.046	0.044	1.74
90% confidence												

power to detect a mean 25% change over a ten-year period in point-count values for individual species present on SWAN plots

The estimated power for the different species given the current number of non-zero plots is given in the table below.

Species	# plots	Average Count	Average Change	Power
Achillea_millefolium	34	32.86	8.35	98.4%
Carex_ramenskii	25	44.08	11.18	99.2%
Deschampsia_beringensis	6	5.50	1.55	4.1%
Elymus_arenarius_mollis	43	42.24	10.64	100.0%
Fritillaria_camschatcensis	13	3.02	1.10	10.5%
Potentilla_palustris	14	8.73	2.43	18.1%
Salix_fuscescens	12	41.27	10.34	72.5%

Some Remaining Issues

- Dropping Swikshak Lagoon Site
- Upgrade benchmarks
- Upgrade data management protocols
- Upgrade bear surveys with study areas
- Sample size requirements

Questions?