A COMPREHENSIVE PLAN FOR

RESILIENT SALT MARSHES IN NEW HAMPSHIRE

NH Climate Summit 2021

Thank you



New Hampshire Coastal Program



Contact: Cory.Riley@wildlife.nh.gov Rachel.Stevens@wildlife.nh.gov







What is the NH Salt Marsh Plan?

A **geospatial** screening tool to assess marsh resilience, and offer site specific management options based on the characteristics of that marsh.

- Land protection
- Management/Restoration
- Research
- Policy





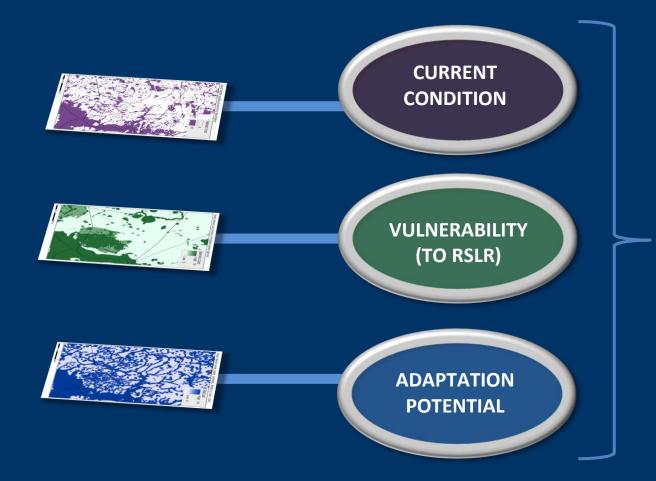
How do we define NH Marshes?

Useful tidbit #1 Marsh Units





National Estuarine Research Reserves



What do we know about our marshes that can help us manage their future? Useful tidbit #2: Clarify what we mean by a resilient marsh

RE

S

ENC





How do we combine information to understand marsh resilience?

Useful tidbit # 3 Geospatial model that has lots of data to play with

Category	Metric	Weight						
Current	Berm presence (agricultural priority)	7.0						
Condition	Ditching - linear feet per MUC	7.0						
	Habitat diversity within MUC (plant and species diversity/ evenness vs Invasives (<i>Phragmites</i> , unless native) MUC area to edge ratio MUC unvegetated to vegetated ratio (edge only)							
	Invasives (<i>Phragmites</i> , unless native)							
	MUC area to edge ratio							
	MUC unvegetated to vegetated ratio (edge only)	10						
	MUC unvegetated to vegetated ratio (area)	10						
	Nitrogen	5.0						
	Percent agricultural cover (150m buffer)	7						
	Percent impervious cover (150m buffer)	8						
	Percent natural cover (150m buffer)	7						
	Threatened and endangered species (from WAP)	5.5						
Vulnerability	Fetch (used as a proxy for wave action)	5.0						
	Percent of marsh below MHHW	8						
	Percent of marsh below MTL	6						
	Soil erodibility	5						
	Tidal range	5						
Adaptation	Hardened shoreline	10						
potential	Shoreline sinuosity	6						
	Size of marsh migration snace	10						



🔹 National Estuarine Research Reserves 🖡

Results: www.nerra.org/landscape-scale-marsh-resilience/







Exciting example of data to play with: High Resolution Tidal Wetland Data







National Estuarine Research Reserves



How do we take geospatial modeling outputs and data and make it useful?

Useful tidbit # 4 Management Options Table

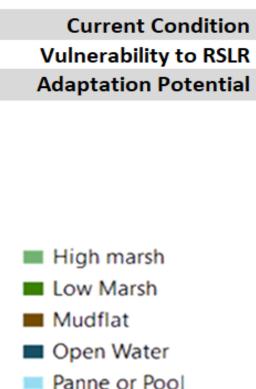


National Estuarine Research Reser

Best Management Options for Enhancing Tidal Marsh Resiliency

To this summaries exercised magnetic gives to eleventialized inclusion and under any and and adult applied adults applied in data and adults. Margenet gives an condentine Margenet gives are condentine for any and adults applied adults applied in the summaries and adults. Margenet gives are condentine for any any adult adults applied adults applied and adults applied adults applied adults applied adults.

Braught and Bryok ont automate										
		Current Condition	<u> </u>	<u> </u>	<u> </u>	<u> </u>	- tes			-
		Current vulnerability to RSUR	Late	sign	100	Hg	14.0	Line .	Han	Long .
		Adaptation Petwerial	100	10ph	low	Law	low	Low	100m	18.0
Management options in	the total back and the		Graad condition mutch	Month am good shape	Its ingoat importor	Constitution	Low condition marin	There is a need to	Roca email and	Prioritiz e etublished
investment of the second se			that is Bullyta migrate	By now laft by to make	rate Fastern up and	current hat print	that is well hely to	metane current	ne bratter techniques	restatetion projects
tifan mucht peilanourit fur a			intent naturally for the	less vulnerable (e.g., bying shand ine or this	modification mult	without active management. Address	pendit in the future.	excellations but priod the edu # inactions to	that improve current	twelve This manufit is it levy to self-sustain in
result incruite stations of your			Long-turns, It's in gold a hope, don't mean with	layer (depending of the	writerios adaptation pomental.	splant splant will be	Malesthis a good place to test espectmental	ativition in uplantane	donafficer doub decreases valoerability to R3.R	The long nerve at
to the second seco			15	ha a diana to alight	provenue.	vulnestifityte	restoration approaches.	intigued	ture Needbladdres	projects will be cost
A "-P" means that option	and here to be an a second secon			inthetution.		mitgladint.	renorman approxime.	inegrand.	both appendia to make a	afection
collegant for this mucht real	Energy of a set second by				1	Exception is if essential	I I		project autoinain.	
and a "R" means the from					1	function is present an			A 14 14 14 14 14 14 14 14 14 14 14 14 14	1
or bretching emetia bight -	trial, we arappe a				1	protect all current high	I I			1
chan agenteed aughter shaa					1	manh	I I			1
The second second second second second	at the second second							-		1
Recommendations are	minth in an				0.0	2.4	0.0	0.0		
saligest ive spectrates. R is fur				and the second second	350	350	39	374		Contraction of the second second
willier furthers, exertises hand			-						THE REPORT	- ALLER AND A
mend for a demoinstration	or put to anoth lists as									
sub-critic funcations, or paddy										
auge des de stualage itse		Number of MUDL In NII 1.234 acres provide	2	Z (1967	1	25	21	2	2.	
recorder ands 22	475.			10.0	40	8.7			16.4	16
		Alerage scale grows								
		Side range (actel)	2.8-136.6	EA FILA	6.7 1154	E.4 - EF68	Ellik - Mi V	40 Min - Sal. 2	10.104 - #102	8187-1-64K
		Priority for resource in extrement in N/P	YES	YES	YES	7	7	,		YES
Management Talhako	Battante	Formale around them								
PERCENDER BARRIER & ARABIER		The set of the set		J	1	L	· · · · ·			
and the /Assos										
Second and the second second second			1 Cor 1	10000		2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		- 10		
Bettehre / decrease / mathy development	When carried condition in high maintainer salamatistics in	Special overlay derivers. Building relations. Real Instantra have	1	1	1	1				
attentia on sub-march Kold.	tion in a single transport of high	modification.	10 A	0.000	1.00	10 C				
Contraction of the second s		Construction of the second second second second second second		1000					~	
Bettaken / despectate / Hold By development	When extentiation potential is high.	Removal and network on of parking areas Removal of buildings.	1	1					1	1
adwritid in the migration pathway	Action workship the best states with a	Adaptationstream of roads. Revmanal of explicit systems.								•
Sector and the sector of the		Series Websers and the series area	1. Contract (1. Contract)			2				
Second and the second se			1							
Advaged relocation of dructures and/or	When summit anothion is high and ether		1	1	1	1				
intradructure in the solution their	volverablity/alose or adoptotion potential light									
Construction of the Construction of the Construction						2				2
Contraction and the second										
Manged releast on of structures, and/or	100 YO M 100 YO M 100 YO M 100 YO M		1	1					1	1
initial fructure is the way of the regration and an articles	When adaptation potential is high.									
						1 1		1		8
						1				
insertives for voluntary exerences or land		Charles and the second states of the		110						
adjutution of orbital regularity performance and	When adaptation potential is high.	Set backer baller and arount. Zerlegger a weby do that	V	1					1	4
sife ma										
UNICPROTICTION										
Plantytor protetion of much bailt (#Ihigh	When carrent condition is high and either									
server continent and terrar and terrar	vulneratel hylicitow or adaptation potential high.	Fee purchae.	1	1	1	1				
important for product ors.										
							H	-		
Protection of migration space	When adaptation patential is high.	Pundhaw fre-or conservadion waterwint	1	1	×	×		x	1	4
No. of Street,								-		
Insertives for voluntary exertents or land		Redensioners Balancers Contractory Top								
angui attion of official religiotion pathways and	When adaptation paternials righ-	Purchased easement, Rolling easements, Deed restrictions, Tax Insultive,	1	1					1	×
arte eta			100 C							
Unit investment in land protection as	When all time real-incyc.traprice jurrent	1000000					200			
the twent suit he relatively depictant.	candition, subversibility, and adaptive potential) and	to be a star of					1			
and the second set of the second	regatus.		12				10000	10.000		-
ESTORATION OR AGAPTATION TED IN QUE										
	·			1 1	1				T T	
Profiling and senses before and the	t When current condition is low or subsectablity is	Removal of barriers to hydrologic flow (http://www.intoine, dbds		163		263	32	1 (A)	22	33
provide to to the surrent mars in Bostprint.	North Comment Conditions is the or Management of the Network of th	remetation etc.). Open moth water metagement CMMM		1		1	1	1	1	4
Annual Contraction of Links and Links		remediation. Involve species management.								
Signet-memory, or highly revolutions,		This layer dometters, ditch nerved ators, normaling ticks gates,								
Individuant with the same manife	When commit condition is one and voluments for the high	then bywer degled then, ditch mersed allow, names ang tale gallen, dreidige material/sectors.					1		1	
forgetet.	1.12									
		Research of the Research of the State of the								
Practitional, well prosent, techniques within		Removal of elevation barriers to regration, either doar to the								
the migration pathway that its not require	When adaptotion provintialita high.	manih adge or higher up in the watenbest. Conversion of built, non-conspiled, initiatinature in migration pathway to return	1	1					1	4
stope modification.	27 E E	contractions, conservations in regration participation of the set								
								-		
Speineral linksperiod to tox or		Lower topology of the migration pathway Rennal of woody								
at their the second or upland side of the	When adaptation pdential is low and carrient	vegetation along workness Guing abovelose projects. Duitid handweed "itse" to extend manh seaward. Use colr logs to			1	1				
sumet mash butyon	carditoringh.	hardward "be" to extend march search Use cor log to promote sedment chillington.			1. Sec. 1.	100				
the second se	When all three realistic years garrent condition, values all its and adaptive potential) are	Choose and Choose					1.10			
and events of in the bottom of all produces and the second s	condition, or a needabling and adaptive potentials are	Lowyar S					1			
and a second sec	negative.	HANNY STREET								

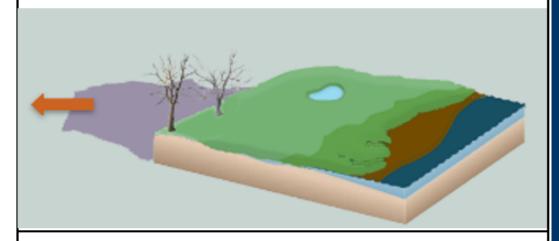


Migration Space

High

Low High

Management Rationale : Good condition marsh that is likely to migrate inland naturally for the long-term. It's in good shape, don't mess with it!



Description: A marsh that is currently in good condition with a wide high marsh plateau and high vegetated to unvegetated ratio, has low vulnerability (e.g. wide tidal range), can migrate inland and may already be showing signs of inland migration.

Best Management Options for Enhancing Tidal Marsh Resiliency

Best Management Options for Enhancing Tidal Marsh Kesilency This bile summission roomende mangement grips is whan it is iman heliency based on the correct condition of each mark and its predicted adaptive cap standard net balance at some of the second	city to relative seal evel rise. Manag	ment options are considered from an ecological, ratherity to relative area level (i.e. Management options are considered from an ecological, rather than indexeconomic, parquedive. For example, "managed relocation" rele
Current Quitorn in this table are reconstructed of coment option is this table are reconstructed of come value ky in that anyy the most independ for each match resultmany category are shown. A "V" means that option is fixed of	1 Low High Good cancellion manh that is likely to migrate Indeed nazwily for the Iong-bern. If it is good a tage, don't meas with 18	Z I I S S Z N High Low High Low Low Low Low High Low Low High Low Low High Low High Low Low Low High Low High Low High Low Low High Low High Low High Low Low High Low High Low High Low Low High Low High Low March Is grand Huge Covet materials Row High High High March Is grand Huge Covet materials Row High High High March Is grand Huge Covet materials Row High High High New Charles High High Row Row High High New Charles High High High Row Row High New Charles High High High Row High High New Charles High High High Row High High New Charles <td< td=""></td<>
A V mean road update in an equipart relevant for this mean testing category and a V mean the fitnencial, exception or biplication cannot help us on the type of management option should be worlded.		Management Options Example project types
Reconstructed lates are made as an utilized two services. It is fully recorption other factors, such as funding would bill by, meed for a deterministrator project is a quarticle location, or prolification of many Number of MICE in NE		LAND USE / POLICY
Augemeide mensangemeint spelzen neuern erstelle die eine Fraugeweid taptose Fraugeweid taptose Fraugew	2 22-103 22-103 745	Remove / decrease / modify development potential on salt marsh itself. Special overlay districts. Building restrictions. Road infrastructure modification.
Nanged miscal on of thrust times and/or miscal music in the altiment the B vulnecial by i low or adapticion potential high.	~	
Nongent missait on of iteratives and/or infastructure in the way of the regration — When adaptation patientials high, pathesy	~	Remove / decrease / modify developmentRemoval and restoration of parking areas. Removal ofpotential in the migration pathway.buildings. Abandonment of roads. Removal of septic systems.
nonchan by voluciny exemutor i and aqui alton of officier in spation pathways, and . When adaptation patential is high. Set back or buffer ordinances. Zoningor averay districts. Baffer at its. UNIGRADITETION	~	buildings. Abandonment of roads. Removal of septic systems.
Prody for protection of much their (all high ammet condition is non-base considered reportant for protection, where all high is and either reportant for protection, where all high is a standard base of the protection of the p	~	
Rotection of migration spaces When adaptation exercisis is high. Purchase fee or conservation exerces	*	Managed relocation of structures and/or
explation of official regration patwork and When adaptation patworks in a provide reactive ready assertants. Level restrictions. Tax Infer edge. When all free real encyclogeness parts	1	infrastructure in the saltmarsh itself
Can't make and the product of a constraint of the product of the p		
Paddonsi, wal prozes, tedrolgans with mot When current condition is low or sidensitie by holding of the interies to hybriding of the interiest to hybriding of the inte		Managed relocation of structures and/or infrastructure in the way of the migration
Paditional, well proven, techniques will in the method particle of the state of the	1	pathway
promie wohrent i sold atoos. Unit investment in ne traston or adaptato mol 4 to e sold arcycological jamet constant, valovability, and adaptive potential; are: Save your 9 register.		Incentives for voluntary easements or land acquisition of critical migration pathways and buffer strips.

Bott Management Oction	s for Enhancing Tidal March	Perilianay									Current Condition	High
This table summarizes recommended managem	is for Enhancing Tidal Marsh rest options to enhance tidal manh real lency base	i R ESIIIE NCY don the current condition of each manh and its predicted adaptive ca	acity to relative sealeseirise M	lanagement options are considered	froman ecological, ratherity to	nistive sea level rise. Maragem	ert options are considered from	n an ecological, rather than socioe	conomic, perspective. For examp	pie, "managed rei	Vulnerability to RSLR	Low
abandoni neor bavine out property			1	1			5		1	8	Adaptation Potential	High
		Current Condition Current vulnerability to RSUR	High	High	High	Hath Hath	Low High	Low	Low High	lan Lan	Adaptation Potential	
Management options in th	his table are	Adaptation Potential	High Good condition manh	High Much Is in good shape	Low Its in good shape for	Caront maintain	Low Low condition match	Low There is a need to	High Rocus established	Hig Prioritize e		Management Rationale : Good condition marsh
recommende dicomervative) the most relevant for ear	ly so that only		that is likely to migrate inland naturally for the	for now but try to make less vulnerable (e.g.,	now Focus on upland modifications that	current fodprint without active	that is unlikely to pensist in the future.	retore current conditions but priof the	ne bration techniques that improve current	restantion		that is likely to migrate inland naturally for the
the most relevant for ea resiliency category are			long-term. It's in good shape, don't mess with	living shoreline or thin layer placement) so it	entence adaptation potential.	management. Address upland options only if	Malesthis a good place to test experimental	anly if barriers to adaption in uplaced as	conversibility to RS.R	likely to se the long te		long-term. It's in good shape, don't mess with it!
A "4" means that option				has a chance to adapt in the future.		vulnerabilityis mitigated fint.	restoration approaches.		here. Need to address both aspects to make a	projects wi effective.		iong-term. It's in good snape, don't mess with it!
relevant for this marsh realls and a "X" means the financia						Exception is Fessential function is			project suital rable.			
or logistical contin high sof management option should	this type of					manh.						
Recommendations are m					-	6. 0	50 cm	24			High marsh	
objective overview. It is full- other factors, such as funding	ly recognized		- H						- 1000-	- 140	Low Marsh	
need for a demonstration specific location, or politic	project in a											
supe ne de management recomm ende d'he	t optiom	Number of MUCs in NI Total acrospe in NH	22 326	25 2,667	31 20.5	35 58	24	21	25	30 22	Mudflat	Allfart
THE APPENDIX PROPERTY OF THE		Average scelp ce-§ Sile range (acrel)	24-1763	102.6	0.7 - 1158	26.7 0.4 - 1748	8.7	64 6 16 - 54.7	820	23	Open Water	
		Priority for resource investment in NIP	YES	YES	YES	7	7	7	7	YE	Panne or Pool	
Management Options NG ACTIONS: the default for all March Laws	Rationale	i sample project types	1			I I			I I	1		
LAND USE / POUCY							, ,				Migration Space	
Remove / decrease / molity development potential on salt manh itself.	When current condition is high and either solved blog is low or a deptation period bigh.	, Special overlay districts. Building restrictions. Road initiating ture modification.	~	<i>s</i>		<i>s</i>						
Remaxe / decrease / maility development , patential in the migration pathway.	When adaptation potential is high.	Removal and restoration of parking areas. Removal of buildings. Alandonment of roads. Removal of septic systems.		5					4			
	When current condition is high and either vulnerability is low or adaptation potential high.		~	<i>s</i>	×	4						<i>Description:</i> A marsh that is currently in good condition with a wide high marsh plateau and
Managed relacation of structures and/or Intrastructure in the way of the migration pathway	When adaptation potential is high.		1	5					4			high vegetated to unvegetated ratio, has low vulnerability (e.g. wide tidal range), can
Incentives for voluntary exements or land acquisition of critical migration pathways and 1 faitfur ship.	When adaptation potential is high.	Set backor buffer ordinances. Zoningor averlay dicitida.		5					4			migrate inland and may already be showing signs of inland migration.
LANDPROTECTION Priorityfor protection of march level" (ail high)			1									
a cost cost i conclusive as considered	When current condition is high and either vulnerability is low or adaptation potential high.	Fee purchase.	~	<i>s</i>	1	4						
Protection of migration space	When adaptation potential is high.	Purchaus fee or conservation exernent	~	×	×	×	x	×	~			
Insentives for voluntary exements or land acquisition of critical migration pathways and faitfur strips.	When adaptation potential is high.	Purchased easement. Rolling easements. Dwed restrictions. Tax I non-til ve.		4					1			
Limit investment in land protection as effectiveness will be relatively short-kern.	When all three real encycategories (arrent condition, valnerability, and adaptive potential) an negative.	n saw yaar 9										
RESTORATION OR ADAPTATION TID IN QUIS												
	When current condition is low or suinerability is high.	Removal of barriers to hydrolog(cflow (bidal restrictions, ditch remediation etc.). Open manih water management (DMWM) remediation. Invasive species management.		4		4	1	4	~	1		
	When current condition is low and vulnerability is high.	Thin layer depailtion, ditch remediation, runneling tide gates, dredge material remark.					4		1			
Traditional, well proven, techniques with in the migration pathway that do not require dope modification.	When adaptation potential is high.	Removal of elevation barriers to migration, either close to the march edge or higher up in the waterohed. Conversion of built, non-occupied, infrastructure in migration pathway to return cover.	1	<i>s</i>					4	4		
	When adaptation potential is low and current condition high.	Lower topology of the migration pathway. Removal of woody vegetation along exotions. Living through the projects. Built of handress of "use" is network means a search Live coir logs to promote sediment a ball action.			×	<i>.</i>						
unit investment in restration or adaptation	When all three real encycategories (surrent condition, vulnerability, and adaptive potential) an negative.	e Saveyzur 9					4					

NOAH



abandoni neor buvine out property.

abandoni neor bavine out property.										
		Current Condition Current vulnerability to RSLR Adaptation Potential	1 High Low High	2 High High High	a High Low Low	4 High High Lair	s Low Hyb Low	ii Low Low	2 Low High High	X Low High
Management optiom in recommended comervativ	elysa that only		Good condition manh that is likely to migrate inland raturally for the	March is in good shape for now last try to make less vulnerable (e.g.,	Its in good shape for now. Focus on upland modifications that	Cannot mainbain current fodprint without active	Low condition manh that is unlikely to pendit in the lature.	There is a need to nettore current conditions but prioritize	Focus established restanation techniques that improve current	Prioritize established restantion projects here. This must his
the most relevant for i realiency category a			Long-term. It in good shape, don't resc with	living shareline or thin layer placement) so it	enhance adaptation potential.	management. Address upland options only if	Malesthis a good place to test experimental	anly if barriers to adapt on in upland are	condition and decrease winerability to RS.R	lively to self-sustain in the long term so
A "st" means that option of the second test option of the second for this mersh results and the second seco			18	has a chance to adapt in the future.		vulnerabilityis mitigated first. Exception is if essential	restoration approaches.	mitigated	here. Need to address both aspects to make a project sustai ruble.	projects will be cost effective.
and a "x" means the finan or logistical cost is high s	cial, ecological					function is present so protect all current high				
management option shou						manih.				
Recommendations are objective overview. It is fu	illy recognized			- Holon					Him	
other factors, such as fund need for a demonstratio	n project in a									
specific location, or poli superse de manageme	nt options	Number of MUCs in NH Total acres grave ter	22 336	25 2,667	1	25 58	24	21	25 513	39 275
recommende di	LINTE.	Average soe ploe4 Size range (acres)	24-126.8	102.6	12.4 0.7 -115.8	26.7 0.8 - 1748	8.7 0.01 - M.V	6.8 0.36 - 58.3	820 6.04 - 272	23
		Priority for resource investment in NIP	YES	YES	YES	7	7	7	7	YES
Management Options MONC'S ONE the default for all Marsh Lans	Rationale	é sample project types				I I			1 1	1
LAND LOG / POLICY					•					
Remove / decrease / motility development potential on salt manh itself.	When current condition is high and either rai reaching ν low or a displation potential high	, Special overlay districts. Building restrictions. Road infrastructure modification.	×		\$	4				
Remove / decrease / motility development potential in the migration pathway.	When adaptation potential is high.	Removal and restoration of parking areas. Removal of buildings. A bandonment of roads. Removal of septic systems.	×						<i>s</i>	×
Managed relocation of structures and/or Intrastructure in the saltmarsh itself	When current condition is high and either vulnerability is low or adaptation potential high.		\$	<i>s</i>	<i>s</i>	4				
Managed relocation of structures and/or Intrastructure in the way of the migration patheory	When adaptation potential is high.		~	~					J	×
Incentives for voluntary exerments or land acquisition of critical migration pathways and buffer ships.	When adaptation patential is high.	Set backor buffer ordinances. Zoningor nverlay districts	×	<i>x</i>					<i>x</i>	×
LANDPROTIETION										
Riorityfor protect on of menh itself (ai high current condition manhes are considered important for protect or).	When current condition is high and either vulnerability's low or adaptation potential high.	Fee punchase.	×	~	<i>s</i>	×				
Protection of migration space	When adaptation patential is high.	Purchase fee or conservation easement	×		×	×	×	×	<i>s</i>	×
Incentives for voluntary exerments or land acquisition of critical migration pathways and buffer ships.	When adaptation patiential is high.	Purchased essement. Rolling essements. Deed restrictions. Tax Insertiwe.	× .						×	×
Limit investment in land protection as effect venue cull be relatively short-term.	When all three reall encycategories (parrent condition, vulnerability, and adaptive potential) an negative.	n Save your Si								
RISTORATION OR ADAPTATION TED IN QUIS										
Traditional, well proven, techniques with mo benefits to the current mars hitrotprint	t When current condition is low or subscribility is high.	Removal of barriers to hydrologic flow (tidal restrictions, disch remediation etc.). Open marsh water management (DMNM) remediation. Invasive species management.		4		4	~	4	<i>s</i>	1
Experi mental, or highly manipulative, techniques within the current manh tectprint	When current condition is low and vulnerability is high.	Thin layer deputition, ditch remediation, runneling tide gates, dredge material removal					1		~	
Traditional, well proven, techniques within the migration pathway that do not require slope modification.	When adaptation patiential is high.	Removal of elevation barriers to migration, either dose to the manh edge or higher up in the watershed. Governion of built, non-occupied, intrastructure in migration pathway to retural cover.	~	~					~	×
Experimental landscape modifications on either the seasand or upland side of the carrent manih lootprint	When adaptation patential is low and current condition high.	Lower topology of the migration pathway. Removal of woody vegetation along ecotons: Using shoreline projects. Build hardened "tee" to extend much seasand Use oir logs to			4	4				

 .

abandori neor bavine out oropertu

$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	abandoni neor buvine out property.										
Image: Section of the sectio			Current Condition	1 High	High	High	Hat	100	Low	low	Low
Burgenergies Burgenergies Subscription Subscription 			Current vulnerability to RSLR					Ha			
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$			Adaptation Potential					Los de la companya de			
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $											
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$				inland roburally for the							
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$											
$ \left \begin{array}{cccccccccccccccccccccccccccccccccccc$											
$ \left \begin{array}{cccccccccccccccccccccccccccccccccccc$					in the future.				_		
Problem P										project sustai rable.	
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $								I L I		1 1	
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$										1 1	
	management option this	ana um anyon uma.								1 1	
	Recommendations are	made as an				640	640 -	400	940		
				11	-Himan	19 an				- History	
										and the second s	
''grand angendarian's market in an angendarian's market in a serie in a seri											
Lanca and all of the second				22	-	1			21		39
Joseph (a) Joseph (a) <thjoseph (a)<="" th=""> Joseph (a) Joseph (a)<td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>0.01 - 14.9</td><td></td><td>0.01-312</td><td></td></thjoseph>								0.01 - 14.9		0.01-312	
	1			YES	YES	YES	7	7	7	7	YES
		Rationale	i sample project types								
Name of the statement of t											
partial and that if if is a subgroup should get on plotting by the subgroup should get on plotting by the subgroup should get on plotting by the subgroup should by the subgroup shoul	LANDING / POLICY		T								
partial part and that fail is an appropriate q_{0} indicate or point q_{0} indicate or poin											
Image: Interpretation of the support of the suppor		 When currents and some high and either value a billing i low or a dust strong strength to b. 	 special over all districts, iau doing reint chois, isolar infrastructure modification. 	✓	1	1	✓				
aim of a to graphic pulse interaction of induced pulse and set operation of the set o											
aim of a to graphic pulse interaction of induced pulse and set operation of the set o											
partial is an grant printing Addresses of the large frage printing Addresses of the large frage printing Image of the large frage printing <thimage frage="" large="" of="" printing<="" th="" the=""> Ima</thimage>	Remove / decrease / modility development	When adaptation optiential is high.	Removal and restoration of parking areas. Removal of buildings.	1	1					1	1
$\frac{1}{10000} = \frac{1}{10000000000000000000000000000000000$	potential in the migration pathway.	to an analyze and been come to the	Abandonment of roads. Removal of septic systems.								•
$\frac{1}{10000} = \frac{1}{10000000000000000000000000000000000$											
$\frac{1}{10000} = \frac{1}{10000000000000000000000000000000000$	A how word as less if we will show how a word by	When a second second line is black and although									
Let the start of at a tark weight in place is the start of the register place is the start of the regist				1	1	1	1				
$\frac{1}{1000} \frac{1}{1000} \frac{1}{1000$											
$\frac{1}{1000} \frac{1}{1000} \frac{1}{1000$											
index		When substitution patiential is high		3	3					1	1
space data of colis of registron particules and where adaptation patienties high. Set back or hardwood registron particules. Image: Colis of		terret and care particular right									•
space data of colis of registron particules and where adaptation patienties high. Set back or hardwood registron particules. Image: Colis of											
with attrix Image: Constraint of the set											
Mode NUME Image of a model had all shifts in a model and shifts in a state of a model and state in a state of a model and state in a model and shifts in a state of a model and state in a model and state in a state of a model and state in a state of a model and state in a model and state in a model and state in a state of a model and state in a model and state in a model and state in a state	acquisition of critical migration pathways and	d When adaptation potential is high.	Set backor buffer ordinances. Zoningor overlay districts	✓	✓					✓	✓
Northyfor ganter to or much hanf (all ph) cameter and too in light) and share valended by (inter a subgerior) passed by (inte	buffer ittipa.										
americant for machaise and with a second states of the probability of the second states of the probability of the second states of the	LANDPROTIETION										
americation methanas and with an experimentation of the probability of the second seco	Distribution contact on of smarth itself (d black										
$\frac{1}{10000000000000000000000000000000000$		when current condition is high and either	Fee purchase.	1	1	1	1				
Instrumentary sequences for land graditions of its gradition place fully input to place fully input to affer erigs. Purchased essences:. Belling essences:. Ded netrictions. Tax insertises Image is a place input to insertises.		vulnerability is low or adaptation potential high.					-				
Instrumentary sequences for land graditions of its gradition place fully input to place fully input to affer erigs. Purchased essences:. Belling essences:. Ded netrictions. Tax insertises Image is a place input to insertises.											
Instrumentary sequences for land graditions of its gradition places lab (response) affer erigs. Purchased essences:. Bellig essences:. Ded resistions. Tax insertise. Image assences:. Ded resistions. Tax insertise. <thimage assences:.="" ded="" resistions.="" tax<br="">insert mans insert</thimage>											
interface	Protection of migration space	When adaptation potential is high.	Purchase fee or conservation easement	✓	✓	x	x	×	×	✓	✓
interface											
indication of critical in gration pathways and When adaptation protectial is high: Production duration is not gradients: Image: Control Contervice Contection Control Control Control Control Con	In such as the university of an end of the										
$\frac{1}{1000} = \frac{1}{1000} = 1$	acquisition of critical migration pathways and	d When adaptation potential is high.		1	1					1	1
In the intermet of the optication as magnetic in the optication as the set of the optication as the set	buffer strips.		Inovitive.								
In the intermet of the optication as marked in the address opticable as the set of the opticable intermet and backet as possible. In the set of the address											
Industry function, and adjust and point adjust adju	Unit investment in land protection as										
ESTORATION OR ADAPTATION TEDINQUES Taditional, well proven, techniques with most When current condition is low or winerability in the marked ability of the intervent to addition etc.). Open mark water management, DIWMM remediation, etc.). Open mark water management, DIWMM remediation, intervent condition is low and vulnerability in the anvent condition is low and vulnerability. This layer degraition, nameling tide gates, drived and the current mark biotry intervent. This layer degraition, nameling tide gates, drived and the current mark biotry intervent. This layer degraition, nameling tide gates, drived and the current mark biotry intervent. This layer degraition, etc.) Current layer degraition, setter dose to the mark data of the current mark biotry intervent. This layer degraition, setter dose to the mark data of the current mark biotry intervent. This layer degraition pathway to relate in the current mark biotry intervent. This layer degraition pathway to relate in the current mark biotry intervent. This layer degraition, setter dose to the mark data of the current mark biotry intervent. Current layer degraition pathway to relate in the current mark biotry in the water of the migration pathway to relate in the current mark biotry in the water of the migration pathway to relate in the current mark biotry in the water of the migration pathway to relate in the current mark biotry in the water of the migration pathway to relate in the current mark biotry in the water of the migration pathway to relate in the current mark biotry in the water of the migration pathway to relate in the current mark biotry in the water of the migration pathway to relate in the current mark biotry in the water of the migration pathway to relate in the current mark biotry in the water of the migration pathway to relate in the current mark biotry in the water of the migration pathway to relate in the current mark biotry in the water of the migration pathway to relate in the current mark biotry in the current mark biotry in the current			W 12 HP YOLK \$P					×			
Traditional, well prosent, techniques with most When current condition is low or wineschilley is here dation stc.). Open much water management: DNWMA here dation stc.). Open much water management: DNWMA high. Bernoval of barriers to hydrologic flow (tidal restrictions, dath nemedation stc.). Open much water management: DNWMA botprint bit in the current manh bit is low and vulnerability is high. When current condition is low and vulnerability is high. Bernoval of elead on barriers to migration, either does to the manh edge of bit equal to barriers to migration pathway to inturi low modification. Convertion of bulk, hore modification. Convertion of bulk, hore modification convert manh bit in the superiment in migration pathway to inturi low emodification. Convertion of bulk, hore modification convertion of bulk, hore condition is been and the migration pathway to inturi hore convertion of bulk, hore convertion of											
Participance of provincipance of more version darbox of version da	RESTORATION OR ADAPTATION TED IN QUE	5									
Participance of provincipance of more version darbox of version da			Removal of barriers to hydrologic flow itidal restrictions, disch								
Departmental, or highly manipulative, budge material network condition is low and vulnerability is the department name high. Thin layer departition, datch nemediation, nunneling tide gates, dendge material network of elevation barriers to migration, ether does to the non-congelet, infrastructure in migration pathway be network does material network of elevation barriers to migration pathway be network does not require the subject of the subject of the subject of barriers to migration pathway be network does not require the subject of elevation barriers to migration pathway be network does not fication. Image: Constructure of the subject of the subject of the subject of the subject of barriers to migration pathway be network non-congelet, infrastructure in migration pathway be network Image: Constructure of the subject					1		1	1	√	1	1
Which carrier conductor is low and vulnerability. This tay or depiction, cannot light too, after nemediation, nameling toole gazes, diverge material instruction, nameling toole gazes, diverge material instruction is low and vulnerability. Which carrier condition is low and vulnerability. This tay of depiction, nameling toole gazes, diverge material instruction, nameling toole gazes, diverge material instruction is now adaptation pathway to infund. Image material instruction is now adaptation pathway to infund. Image material instruction is now adaptation pathway to infund. Image material instruction is now adaptation pathway to infund. Image material instruction is now adaptation pathway to infund. Image material instruction is now adaptation pathway to infund. Image material instruction is now adaptation pathway to infund. Image material instruction is now adaptation pathway to infund. Image material instruction is now adaptation pathway to infund. Image material instruction is now adaptation pathway to infund. Image material instruction is now adaptation pathway to infund. Image material instruction is now adaptation pathway to infund. Image material instruction is now adaptation pathway to infund. Image material instruction is now adaptation pathway to infund. Image material instruction is now adaptation pathway to infund. Image material instruction is now adaptation pathway to infund. Image material instruction is now adaptation pathway to infund. Image material instruction is now adaptation pathway to infund. Image material instruction is now adaptation pathway to infund. Image material instruction instruction instruction instruction instruction instru	denerated the carriers many moophing	ngr	remediation. Invalve species management.								
Which carrier conductor is low and vulnerability. This tay or depiction, cannot light too, after nemediation, nameling toole gazes, diverge material instruction, nameling toole gazes, diverge material instruction is low and vulnerability. Which carrier condition is low and vulnerability. This tay of depiction, nameling toole gazes, diverge material instruction, nameling toole gazes, diverge material instruction is now adaptation pathway to infund. Image material instruction is now adaptation pathway to infund. Image material instruction is now adaptation pathway to infund. Image material instruction is now adaptation pathway to infund. Image material instruction is now adaptation pathway to infund. Image material instruction is now adaptation pathway to infund. Image material instruction is now adaptation pathway to infund. Image material instruction is now adaptation pathway to infund. Image material instruction is now adaptation pathway to infund. Image material instruction is now adaptation pathway to infund. Image material instruction is now adaptation pathway to infund. Image material instruction is now adaptation pathway to infund. Image material instruction is now adaptation pathway to infund. Image material instruction is now adaptation pathway to infund. Image material instruction is now adaptation pathway to infund. Image material instruction is now adaptation pathway to infund. Image material instruction is now adaptation pathway to infund. Image material instruction is now adaptation pathway to infund. Image material instruction is now adaptation pathway to infund. Image material instruction instruction instruction instruction instruction instru											
botprint ngn. dredge miterial reduction dredge miterial reduction barriers to regration, either does to the mark edge of behavior to require When adaptation potential is high. non-coupled, intratruture in migration pathway for down? Cover.		When current condition is low and vulnerability is	This layer departition, ditch remediation, runneling, tide gates,							1	
Tadtional, well prover, techniques within manh nége or higher up in the valenched. Conversion of bulk, non-occupied, inhartrature in migration pathway to ratural cover.											
randoma, we prover, berningest with in the same prover, berningest with in the same hole. Conversion of built, non-coupled, intractivature in migration pathway to intural cover.											
the migration pathway tat do not require When adaptation patential it high: non-oncupied, initiatruture in migration pathway to natural cover.	Traditional, well proven, techniques within		Removal of elevation barriers to migration, either dose to the march effects of biology and the violational. One are intered to be								
tope modification. cover.	the migration pathway that do not require	When adaptation potential is high.	non-occupied, infrastructure in migration pathway to ratural	1	1					1	1
	slope modification.										
			Lover topology of the migration pathway. Removal of woody								
After the seaward or upland side of the when adaptation patentials low and current vegetation acceptances using increase projects used	Experimental landscape modifications on either the seaward or upland side of the		vegetation along ecotone Living shoreline projects. Build			1	1				
unvert mark todpolit. condition high. hardeved "tex" to extend mark assuand Use coir logs to		candition high.	hardened "toe" to extend marsh seaward Use coir logs to								

How can we simplify this for a particular Marsh Unit?

Useful tidbit #5 Marsh Profiles



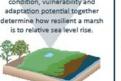
PLANNING FOR RESILIENT SALT MARSHES IN NEW HAMPSHIRE

SAGAMORE CREEK LOWER SOUTH, PORTSMOUTH



Tidal wetland systems are important transitional habitats between the ocean and land. Salt marshes in particular provide essential functions for people. They support healthy fisheries, protect shorelines from erosion, reduce flooding, enhance water quality, and provide essential fish and wildlife habitat. This project assesses the current and future conditions of salt marshes statewide and recommends the best management options for each marsh to optimize resiliency in the face of relative sea level rise

Measurements of current condition, vulnerability and



57.5 acres 2 000 Brackish marsh Panne/pooi Open water **High marsh** Phrogmites spp Wrack Low marsh **Recently flooded forest** Migration space Mud flat Mud flat Marsh unit boundary MARSH RESILIENCY

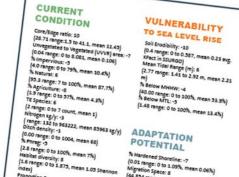
6 All values are on a scale of 1 to 10 and compare to a state average of 5 CURRENT 10 CONDITION

VULNERABILITY TO SEA LEVEL RISE



Major contributing factors High score for habitat diversity and core to edge ratio. Positively there very little surrounding agriculture. Highly erodable soil.

Has a relatively large migration s 5 but limited connectivity to other wetlands as sea level rises.



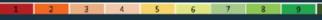
NE Fetch (living shorelines): -1 (6 range: 1 > 3mi to 6 < 0.3 mi)

% Below MHHW: -4 (40.00 range: 0 to 100%, mean 33.9%) % Below MTL: -3 ADAPTATION POTENTIAL % Hardened Shoreline: -7 Migration Space: 8 Proportion Berms along upland edge: -4 (0.1 range: 0 to 0.401, mean 0.126)

buffer maintenance

and ditch remediation

National Estuarine Research Res



(1.48 range: 0 to 100%, mean 13.4%) (0.01 range: 0 to 1.09%, mean 0.06%) (44,834 range: 0 to 772934, mean 43617) Connectedness: 1 (0 range: 0 to 6382, mean 270) iosity: 3

(-0.67 range: -0.99 to 0, mean -0.3 a value closer to 0 is more complex!

PLANNING FOR RESILIENT SALT

LAND CONSERVATION: This marsh and its migration space are already under conservation. R natural forested buffer on the surrounding upland will help maintain its good current condition RESTORATION OR ADAPTATION PROJECTS: There is only a limited amount of ditching in this reasonably small-scale, and so affordable, citch remediation project would likely restore nature

LAND USE OR POLICY: Managed relocation or adaptation of infrastructure in migration space in

* FEASIBILITY: This is one of only \$2 "highly feasible" marshes for project implentation

RECOMMENDED MANAGEMENT OPTIONS

This project is a colleboration among multiple coasts (construction, planning, restoration, and science practetioners, for more information to a construct Duckst Coasts - Coast Bar, National Francisco, Datasets, Restoration, and science practetioners, for more information to a coast - Coast - Coast Bar, National Francisco, Datasets, Restoration, and science practetioners, for more information to a coast - Coast This project is a collective on among multiple coastal conservation, planning, restoration, and strange practicioners for more information planning, restoration, and strange practicioners for more information planse context. Rachel Stevens, Greet Bay Netional Erustrice Research Reserve, rachel stevens; dwildlife in gov or Kevin Lucey. Netional Context in the set of the se presse context nacher stenend, urest dev historial columne nasearch nezerve, nachelistevens@wildlide.nh.gov or Xevin Lucey. Nr Cossal Program, Kevin Lucey@idex.nh.gov.GIS modeling was done by NOAA, UNH and Kate Calianan of NH Feh and Game Department. Grassic nezerve by Cashel Servery Back analysic network from

DATA EPT

in the state. Feasibility is based on size

parcels, number of ownerships and the

of development within the marsh migra

FEASIBILITY Count of Parcels: 1 (range: 1 to 120, mean 12) Count of Parcels over 10 acres: 1 (range: 0 to 10, mean 2) Count of Parcels with 10+ac undeveloped mig. s (range: 0 to 3, mean 0.3) Parcels inundated by short-termSLR: 1 (range: 0 to 118, mean 12) Parcels inundated by long-term SLR: 1 (range: 0 to 120, mean 12) development inundated by short-term SLR: ; (range: 0 to 18.2 acres, mean 0.9 acres)

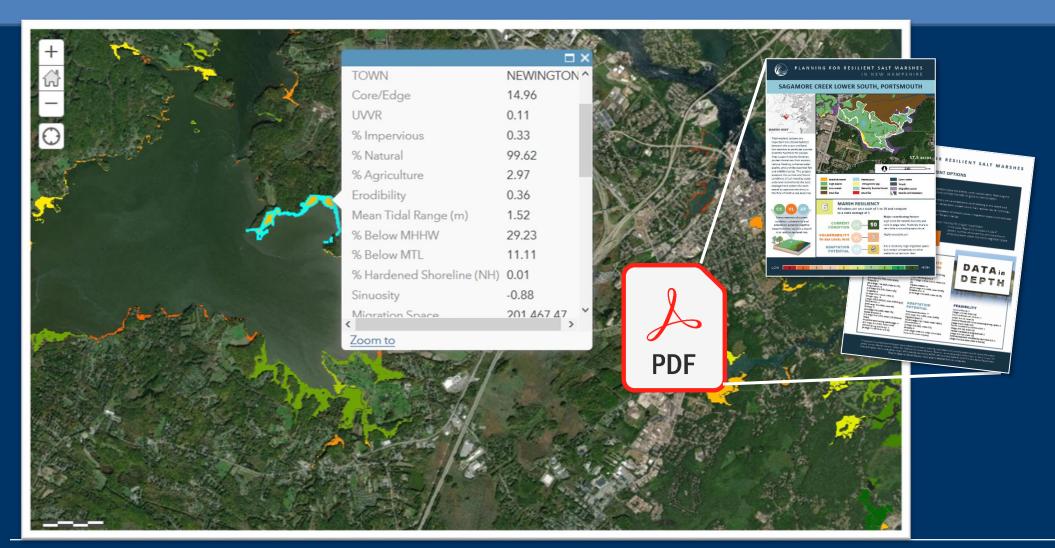


How can we make sure people can access the profiles, the resiliency scores and all that data?

Useful tidbit #6 Online map based viewer



Useful Online Viewer





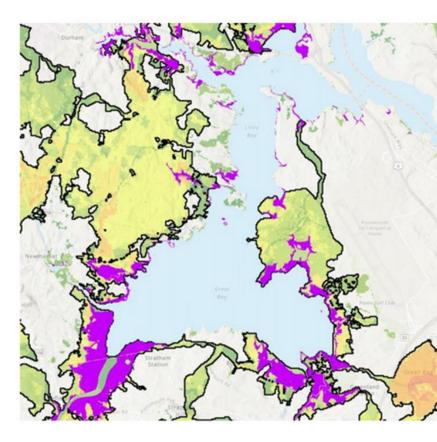


What if we want to use the model to look at prioritizing actions across the state?

Useful tidbit #7 Ability to run a customized model.

Salt Marsh Add-in Update

- Black outline Represents the filtered prioritization
- Color Ramp is the prioritization before the filtering with weights represented
- How do we add in important salt marsh areas that have been filtered out of the prioritization?
- Methods:
 - Used resilient marsh management categories (GBNERR 2020) and associated undeveloped migration space and merged those areas together
 - After looking at this initial result we decided to use resilient marsh units and their migration space as an additional input into the weighted sum to better capture marsh systems (vs. fragments)







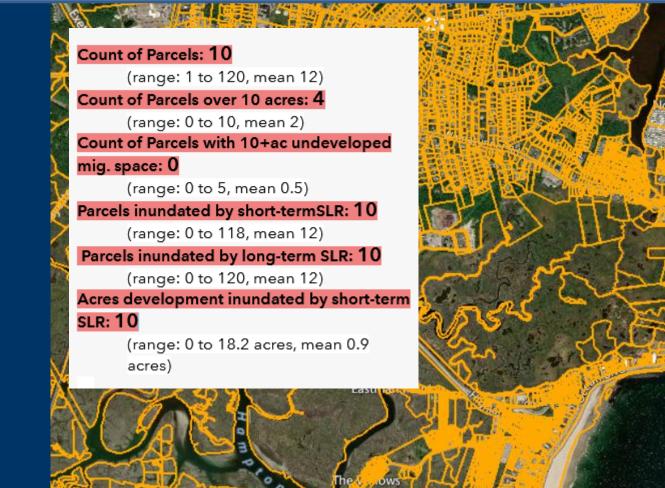
Best Management Options for Enhancing Tidal Marsh Resiliency

Nat

This table summatives recommended management aptions to exhause table may based on the current condition of each manh and its predicted adaptive capacity to relative sealered from an ecological, ratherity to re

Bandhi neor Bwine out property											
Management options in this table are recommended correspondingly to that only the most indexist for each march milliency category are shown. A "4" means that option is <i>Nighty</i> relevant for this manch molliency category and a "4" means that option is <i>Nighty</i> .	Carnet Conductory to DEA	High Low High Cond condition manh that il holyto migrato Inhad naturally for the Inage from: His in good in hope, don't meas with 18	High High High Numh Is In good shape for now Left ty to make less vulnerable (e.g., Inving showils no et him layer placement) so it has a shanow to adapt in the future.	High Low Low To Low The Low The Logas for most Focus on upd and modifications that enfance adapted on potwettal.	High High Lange Cannot main rain aurweit foutprint without active management. Address upland options only if vulnerability(s mitighed find. Exception is if essential	Low High Low condition manh that is until ley to peride in the statum. Maine this a good place to test experimental metoration approaches.	Low Low There is a need to retore surrent conditions but proiot12br only () business to adapt on in upland are mtligated	Low High High Roca witabilished ne tractation bechniques that improve cannet condition and derawas valuerability to RB R hore. Nied to address both appendition and enviro both appendition and and both appendition and both appendition and both appendition and both appendition appendition and both appendition and both appendition and both appendition appendition and both appendition and both appendition appendition appendition appendition both appendition and both appendition appendition appendition appendition both appendition and appendition both appendition appendition appendition appendition both appendition appendition appendition appendition appendition both appendition appendition appendition appendition appendition both appendition appendition appendition appendition appendition appendition appendition appendition both appendition append	Low Low High Prioritz = stabilited restoation projects here This must be all high to a difficult the long term so projects will be cost effectue.		
or logitizati carriti high sath hi type of reanagement option should be avoided. Measuremental lan tare made as an object low overview. It hall ynecograded other factors, such as funding would all fly, meed for a demonstration projekt in a specific location, or publical wit may success prevent approxement options necessaries enderthees. Name ender tareas name bester based of the sath table to all table to all table to all provided to all table to all table to all table to all provided to all table to all table to all table to all provided to all table to all table to all table to all provided to all table to all table to all table to all provided to all table to all table to all table to all provided to all table to all table to all table table tab	Number Instant Generation Storman Proving Proving	migratio	on space		Ł	ourchase	e fee or o	conserva	ition eas	semen	it.
Remove / decrease / modify development patiential on salt manh itself. We a subpatience patients by build not environ bain live a subpatience patients by build Remove / decrease / modify development patiential in the migration pathway When adaptation patiential is high. When current condition is high and either valuescalibly (since or set) and either valuescalibly (since or set) and either valuescalibly (since or set).	a) a Special over a serve . Building restrictions. Read infrastructure resold cody Removal and restoration of parking areas. Removal of buildings. Alandonment of roads. Removal of anytic systems.		3 3 3	1				-			
Nanged nelocation of dractices and/or interactional in the way of the regration when a section potential is high applicables be voluntary essence to of a map allocation of official regration paths and when adaptation potential is high. Barrier drap. UNICPROTECTION	Set backor buffer and nerves. Zoninger a vertay district.	*	1					1	3 3		
Notesfore provision of month table (All high annet congruence of the same considered imposition of the same considered imposition of the production, and a same constant of the Robection of migration space. When adaptation potential is high.	Fee purchase.	1 1	3 - 3	√ x	√ x	x	×	4			
Inacthes for voluntary exernets or land axpliation of ortifol migration patways and When adaptation patentials high. Taffer strips. Unit insectment in land protection a direct some will be relatively shorteem. register.	Purchased easement: Rolling easements. Deed restrictions. Tax Inorities.	4	1			J.		1	3		
IESTONATION CRIAGAPTATION TICLINGUES Taditional, well proxen, techniques with most When current condition is low or winerability is benefits to the current manipulation, benefits within the current manipulation, winingues within the current manipulation bight	Removal of barriers to hydrolog critice (total restrictions, dtsh nemotation etc.). Open much water management (DWMM) nemotation. Invasive species management. Vin byer deposition, dtsh nemodation, runneling tide gates, dredge, material remarka.		*		*	3 3	*	3	3		
Taditional, well proxen; techniques with in the migeation pathewy hash do not require slope modification. Diperimental landscape modifications on effect the seaward or upland is do if the unrent mumih bactyrint.	Removal of elevation barriers to regration, either dose to the march algo or higher up in the waterched. Conversion of built, non-complet, infrastructure in migration pathway to return cover. Lower topology of the migration pathway Removal of woody vegetation along extrans. Using thereines projects. Build handwerd "bai" to a stored march seasand Lies coir logs to promote and ments tabil allows.	4	3	3	3			1	1		DOOD
Unit investment in restantion or adaptation project as effectmenses will be short-term register.						~					b PROVIDENT US

Marsh Migration Pathways Example



HIGH FEASIBILITY Low parcel count Large parcels Large amount undeveloped migration space

Low amount of long and short term flooding





Take Away From this Presentation

- Marshes take care of us, lets take care of them thoughtfully.
- WE WANT TO USE THIS to be strategic and efficient with resources.
- We expect this all to be done in about a year.
- There will be additional outreach to communities, restoration professionals, and land protection partners.
- This is a screening tool, so site level analysis will always be needed.

