Notes from New York Natural Heritage Program 5-31-14

PP-O Q coc, alba, rubra, vel; Q ilic,
Other spp - Bracken, Carex penn, Gaulth, V. pallidum, V. angust
with other types comprises pine barrens
variant to PP-O-Maple to RM-Black Gum as ↑ RM, Clethra,
Gay. frondosa, Nyssa, Rhodo viscosum, Lyonia, Leucothe

PP-O-H - summit Q alba, Q. cocc, Q. vel,
PP, Chest Oak, SO, Juniper Vacc. ang, Comptonia, Gay, C Penn
Danthonia, Deschamp Arcto, Hudsonia, Lechea,

PP-SO Barrens Q ilic + prinoides, Comp., Vang + pallidum, Gay
Andro, Sorghastrum, Lespedeza, Lechea, Polygala, Tephrosia,
Lupinus,

Oak-Heath Q coc, Q alba, Q vel, Q montan.
wants 25%
can includ Aureolaria, Arctostaphylos, Tephrosia,
Lechea sun-loving C swanii
Not much of follow, or grades into those types:
Beech, holly, WP, PP, Q. stellata, Smilax, (Liriodendron)
or Prunus, Acer, Sass.

Oak-Hickory want 25% Carya
also Vib acer, Carex swanii, Vacc. corym

Oak-Holly Holly, beech, Vacc corym (Kalmia,) Thelypteris
(Cornus florida)

Maritime Beech - N facing bluffs, back portions of dunes welldrained sand
BO, RM low, some Smilax, Aralia, Epifagus
Grades into PP, PO, Juniper, Ilex, Prunus, RM, Nyssa, Sass
considered "successional"

Maritime grassland, heathland, shrubland, dunes, interdunal swales
>50% g <50S; >50 Sh >50% H. red cedar forest

"Must be close enough to ocean to be subject to maritime influences

Maritime Holly grades into Juniper, Oak, or Successional
Maritime forest - Acer, Nyssa, Sassafras

Maritime PP Dune Woodland - Arcto, Gay, V cory, Hudsonia, Myrica,
SO, Smilax, Poison ivy, Deschamp, Carex penn, Andro, Trientalis.
Panicum,
"characteristic maritime spp":
→ Maritime Post Oak with Myrica, Smilax
Post oak - Myrica - original coastal forest?

Maritime Shrubland - maritime influence
Maritime Shrubs - Amelanchier, Prunus, Vib. recognitum, Rhus cop, Vib dentatum
Myrica penn, Prunus maritima, T. radicans, Rosa rugosa
Ilex, Q. vel, some V corym, Clethra, Partheno, Smilax, Rhus tox, Celastr, Lonicera

Successional maritime forest - must be salt influenced; burned or old pasture; Q. vel, Q. stell, Amelanchier, Q. alb
Prunus, Acer, Nyssa, Sass > Juniper > Oak or else grades into; Vitis, Tox rad, Partheno, Smilax
a "climax maritime forest"; Myrica, Robinia, Privet, Celastrus, Lonicera, Wineberry

Oak-Beech Be, Q rubra, Acer sacc, Bet pap,

Mar Heath - Arcto, Hudsonia, V ang, Gay, Myrica, P maritima, Deschampsia,
Carex pen, Andropogon, Juncus greni

Exploring Major Veg Types

Pitch pine Forests.

AW PP - Native almost exclusively
West Chop Woods; Southern Woodlands; Ripleys Field Preserve
Carpenters Woods Phillips Lowd
extending into Northern Pines; Areas on MFCSF - S end before
and aftr triangle and E side S + N.

~~Map PP x AW to~~

Secondary PP - Combination of successional + planted with latter
often challenging to discern as not necessarily rows, some very
old (1840s on) and can spread. Same size/age

Map - AW base x PP to generate 4 shades - White, PP, PPxAW, AW
Possibly include Exotic Plantations = NS, WS, RP

Oak Woodland

AW - Margaret Littlefield Greenlands - Pohogonot
MFCSF; Caroline Tuthill - Felix Neck - Pennywise; Tisbury Meadow
Chappy Five Corners
Preserve - Wapatequa Woods; Long Point - Ribbon Lots - Medicine Lots;
Menemsha Hills; Peaked Hill; Felix Neck; Tiasquam River Res
Quansoo

SW -
confounding of land use + site

← Mixed Deciduous - Cedar Tree Neck; Waskosims; Seven Gates;
Gayhead Moraine;
Beech - Polly Hill, Cedar Tree Neck
Pohogonut

Scrub Oak MFCSF; Pennywise; Quansoo Area
Restricted by soils and land use; SO eliminated by clearance?

Heathland / Grassland / Fields

Active Ag vs Grass/Heath/Shrub/Old Field

Maps 1848 -90- 1938 -62- 2000 w/ 2000 showing major categories

Interesting + accessible Heath - Moshups, West Basin, Katama Wasque

Subject: RE: An additional request Re: Hammond Files
Date: Tuesday, June 10, 2014 5:29:19 PM Eastern Daylight Time
From: Elizabeth Loucks
To: Foster, David
CC: Tom Chase

Hi David,
This afternoon I double checked Bruce Hammond's files in the basement and then I rummaged through 7 storage boxes of Tom's files in the closet. I think I found the information you want in a box on the bottom of the stack. There are groupings of Site Check forms from 2002 for the MV Moraine. I put the folders that might be relevant in a box and left it in Tom's office for you to retrieve.
Liz

From: Foster, David [mailto:drfoster@fas.harvard.edu]
Sent: Sunday, June 01, 2014 7:07 AM
To: Elizabeth Loucks
Cc: Tom Chase
Subject: An additional request Re: Hammond Files

Liz

When you have time it would be great if youwould look for additional files for the MV mapping project. Reading these materials over closely it is clear that the box you found covers one-half of that effort – the air photo analysis and GIS work on the outwash plain. In that contract it indicates that there would be a second contract for the moraine in order to complete coverage of the entire island (and since we have a map covering the entire island I gather that they went ahead with that). Finding that would be useful because in the report for the contract the Umass folks who did the work describe their questions and levels of certainty with identification of the various vegetation types. That was based on field checking that they did.

So, there may be another box or set of files.

Thanks, David

David R. Foster   978.724.3302
Director, Harvard Forest, Harvard University
324 N. Main Street   Petersham, MA 01366

From: <Foster>, David Foster <drfoster@fas.harvard.edu>
Date: Sunday, June 1, 2014 5:14 AM
To: tchase <tchase@TNC.ORG>
Cc: Liz Loucks <eloucks@tnc.org>
Subject: Re: Hammond Files

Thanks - Will be interesting to see how those next steps take shape.

Best, David

David R. Foster   978.724.3302
Director, Harvard Forest, Harvard University

324 N. Main Street   Petersham, MA 01366

From: tchase <tchase@TNC.ORG>
Date: Saturday, May 31, 2014 7:26 PM
To: David Foster <drfoster@fas.harvard.edu>
Cc: Liz Loucks <eloucks@tnc.org>
Subject: Re: Hammond Files

David,
Thanks, but drop off the files at your convenience.

I'd LOVE to nuke the white pines, for exactly the same reasons. I hope that DCR will finally finish a management plan, with a new manager on board.

TC

Sent from my iPhone

On May 31, 2014, at 7:02 AM, "Foster, David" <drfoster@fas.harvard.edu> wrote:

> Liz and Tom
>
> When I heard that Liz was going to be out Thursday I decided to go for a hike myself and then enjoyed the two days completely forgot to drop off the box. My apologies. Unless you need it, in which case my daughter can drop it by next week, I'll hang onto it as Im heading off-island Monday early and will drop it by when I'm back out in a couple of weeks. I did find the mapping details useful and we got our vegetation plots sorted out according to the TNC map units so Im making progress with my quest.
>
> From the looks of the smoke and signs near the airport I gather the burn went well.
>
> I walked quite a lot in the region south form the Smith parking area and wondered whether there had ever been any thought of selectively removing the white pines that are seeding across the Edgartown-WT road from the plantations. My expectation is that over time white pine will take over increasingly larger areas of oak and pitch pine forest across the island and yet in many areas like the north end of Pohogonot its control would be pretty straightforward.
>
> Thanks for your help.
>
> Best, David
>
> ---
> David R. Foster   978.724.3302
> Director, Harvard Forest, Harvard University
> 324 N. Main Street   Petersham, MA 01366
>
> ---
>
> **From:** <Foster>, David Foster <drfoster@fas.harvard.edu>
> **Date:** Thursday, May 29, 2014 8:34 AM
> **To:** Liz Loucks <eloucks@tnc.org>, tchase <tchase@TNC.ORG>
> **Subject:** Re: Hammond Files
>
> OK, thanks and good luck.

David R. Foster   978.724.3302
Director, Harvard Forest, Harvard University
324 N. Main Street   Petersham, MA 01366

From: Liz Loucks <eloucks@tnc.org>
Date: Thursday, May 29, 2014 8:28 AM
To: David Foster <drfoster@fas.harvard.edu>, tchase <tchase@TNC.ORG>
Subject: RE: Hammond Files

Ok. I'll be out of the office this morning and possibly all day as dcr called me yesterday about helping on a potential rx fire on the state forest today I'd things dry out enough after yesterday's light rain.

Sent from my Verizon Wireless 4G LTE Smartphone

-------- Original message --------
From: "Foster, David"
Date:05/29/2014 8:15 AM (GMT-05:00)
To: Elizabeth Loucks ,Tom Chase
Subject: Hammond Files

Liz and Tom

Thanks for digging out those file yesterday. I went through them and they are largely centered on the actual air photo interpretation undertaken by Umass. These do include ground-truthing notes by Janice Stone and others as well all of the individual hand-drawn overlays by the photo-interpretors. But these are all based on structure and gross characteristics and have nothing that mentions any species whatsoever and do no include any field sheets for vegetation.

The whole thing is a bit mystifying as there are a number of forest types on the Vineyard that don't occur on Nantucket and it isn't clear how such fine vegetation distinctions could be made without field checking.

I'll return the box today and would gladly look at anything else that you might find or want to pass along.

Best, David

David R. Foster   978.724.3302
Director, Harvard Forest, Harvard University

Summary of TNC Vegetation Mapping 6-14-14

Contracted with UMass NRAG - used color IR ~1993 photos
Work done 2001 + 2002 in 2 projects - moraine + outwash
Outwash field checkig by NRAG + TNC - Debra Swanson contract
Moraine unclear
No TNC strong botanist overseeing. Bruce Hammond
for part of work (or all?). Tom Chase generally
in charge. Julie Lundgren from distance.

Attempt to standardize types to Heritage programs
and TNC National Classification

Many types on MV not on ACK so much more complicated

TNC Files - Wakeman Center ~2001-2

Photo Interp of Moraine

Draft 3 pp document - Photo Interp of Plant Communities
on Moraine of MV ~2001 July
TNC + NRAG UMass ~27,000 ac - glacial moraine
Communities by TNC + NRAG - ACK, MA NHESP + TNC National
Veg Class. System → preliminary lists
TNC will cross check systems (Note: need a field biologist + $)
Wetlands from J Stone DEP MA work
1993 color IR 1 ac minimum mapping
First 3 overlays for review
TNC will digitize - outside contractor
Milestones - TNC field checking
$16,192

Pencil Note to Peter (?): Main issue - TNC needs a botanist
① Call Julie Lundgren - when can you train someone?
② Who will it be? Network via TDR, Steinauer, Finton (Knapp), Brumback
③ When? May - Sept 2002

2 page + cover sheet fax: To Tom Chase from Tom Nuermingr
Note: Draft copy of moraine project; need starting date
and discuss how TNC will do field checks

Meeting Notes: Christin Fauteux, Julie Russell, Kim Rothley, Sasha Clinton?
Tom Chase, Lloyd Raleigh, Peter Morgan, Dick Johnson
Cons Partnership? Discuss info needs on various subjects:
spp. needs for various types [illegible] + umbrella spp

over

criteria on patch sizes

fire + salt overlay

Use GIS etc to id. minimum viable patches

use to id restoration needs, acquisition

Meet in fall to discuss

Report progress on OG woodland (Wendy Breig upcoming thesis)

+ Watershed protection

TC - landscape functions -

TNC MV Mapping 2002 ,-15-2014

Morainal area UMass Group Natural Resource Assessment Group

Second box of notes and field sheets and a map found in the Mary Wakeman Center basement by Liz Loucks

Map - large-scale GIS showing Island with dozens of pencilled polygons with questions regarding specific vegetation type determinations

Sheets #1 ~~Batch~~ 4 ~~batches~~ - Site check sheet - NRAG, This is the bulk of the file. CSH ok, COMS or COHE, PP or RCW,

Then individual sheets with notes - e.g. Road to #2 is called Holly Holm and most evergreens are American Holly. Some v. large

~~##~~ Year date ~~##~~ on sheets as 2002 November. No name

File folder 4-26-1999 Sand plain contract

11-17-98 Letter from Julie (Lundgren?) to Tom (Chase) providing thoughts on mapping which is under consideration: MV much more complex than ACK so much more effort; Many MV communities more common on mainland so less well described - would take time; more difficult with Javier Stone leaving; Julie committed to ecoregional mapping so not available to help; Not sure who can help with contouring from ACK

Leah Tofte Dorr thesis - deals with communities of head of ponds.

She is working with Bruce + part of Sandplain meeting

Six page "Functional Community Groups of the North Atlantic Coast" February 11, 1998

~over~

Background
Describes rectifying state classification units against new National Veg Classification association
End product - accepted national classification for North Atlantic Coast - means to assess + conserve biodiversity in ecoregion
TNC + Heritage ecologist efforts - ensure communities of conservation concern accounted for
This document identifies functional groups of communities based on similar processes or habitats so that community targets can be ided before NAC class complete.
Shows broad ecosystem name + corresponding state names

5 page table of community descriptions, equivalents, locations on MV and some important bird spp.

Maritime oak forest
Dry oak-pine forest   Pine-Heath woodland   Pitch Pine-SO-Barrens
Oak-PP woodland (SO + ericad)   Oak savanna (shrubs sparse)
SO frost bottom   SO shrubland   Oak-holly (Maple, beech, hickory)
Maritime beech (BO, Be, Smilax)   Maritime back dune (Cedar, holly, oak, SOSS)
Beech-maple mesic forest   Maple-Beetlebung
Successional maritime   Various heathlands   grasslands

Plastic photo sleeves - Long Pt area; S Shore v Squib; Katama
Copy Ecological Communities of Montauk - John Thompson + M Jordan notes

Various handwritten notes on types + bird species

Peter:

Main issue: TNC needs a botanist

(1) call Julie Lundgren – when can you train someone?

(2) who will it be? Network via Knapp, Stevenson, TTOR, [illegible], Fischer

DRAFT

Photo Interpretation of Plant Communities on the Moraine of Martha's Vineyard, MA

(3) when? – May – Sept 2002

Project Outline

Scope: This project involves the development of a digitized map of the vegetation communities on the moraine landscape of Martha's Vineyard. The project will be undertaken by The Nature Conservancy's Islands Program (TNC) with technical assistance from the Natural Resources Assessment Group at the University of Massachusetts, Amherst (NRAG). The specific elements of this project and the organization with primary responsibility are as follows:

1. This project will encompass the entire section of the island that is defined geologically as a glacial moraine. This area encompasses approximately 27,000 (?) acres and is depicted on the attached map.

2. The natural community classification system will be collaboratively developed by TNC and NRAG. TNC will create a preliminary list of community types suspected to occur on the island based on TNC's Nantucket vegetation mapping project, the MA NHESP's Priority Community List and TNC's National Vegetation Classification System. Through preliminary interpretation of several photos and a field visit, NRAG will advise TNC on which natural community types have distinct aerial photo signatures and whether any new natural community types need to be defined.

3. TNC will cross-check the vegetation classification system for this project to the other classification systems described above. Need to find ecologist or other to do this — and train them

4. Wetlands will be classified based on delineations previously done by J. Stone for the Massachusetts Department of Environmental Protection's Wetland Conservancy Program. so barrier beach

5. The photo interpretation will be conducted by NRAG using 1:12,000 color infrared photos from March -April 1993. Interpretation will be done using positive transparencies where available, with communities delineated on clear acetate overlays. The linework on the acetate overlays will be drawn with a thin (0.001-mm) black pen. All polygons will be closed. All label coding should not touch any linework. CIR photo overlap boundaries will be drawn on each overlay. Minimum mapping unit will be one acre. Concentrations of vernal pools will be mapped to 0.25 acre. NRAG will highlight for further field-checking any areas where the community classification or the photo signatures are unclear.

6. NRAG will provide TNC with the first 3 overlays for review. TNC will provide NRAG with comments on any necessary adjustments in the photo interpretation methodology before NRAG proceeds with the project.

(1) Do barrier beach, too.

(2) Photos taken when? And in TNC's files?

7. TNC will conduct field checks, and NRAG subsequently will make any necessary edits to the draft mylar acetates as well as recommend to TNC any further changes to the classification system.

8. TNC will create a digital GIS coverage with complete polygon label coding. This may require additional work by an outside contractor specialized in ZTS and digitizing of spatial information.

9. Draft digital map review will be conducted by TNC. NRAG will provide advise on problems associated with the interpretation of the aerial photographs

10. The following milestones shall apply to this project:

- NRAG will commence the photo-interpretation work within 1 month of assignment of a account number by the UMass Accounting Department.
- Within 2.5 months of commencement of the project, NRAG will provide TNC with draft mylars depicting natural communities map for the Martha's Vineyard moraine with a list of questions that require further fieldchecking.
- Within five months of project commencement, TNC will complete the field checking.
- One month after receiving the final field comments from TNC, NRAG will deliver the edited vegetation communities mylars and final field notes to TNC.

11. TNC will pay the University of Massachusetts $16,192 for their work on the above listed tasks.

7. Used TNC staff, trained by Julie Lundgren

8. Terry do all of this?

9. " "

DATE: 7/11/01

FAX TO: TOM CHASÉ
ORGANIZATION: TNC
FAX NO. 5086934891

FROM: TODD NUERMINGER
NATURAL RESOURCES ASSESSMENT GROUP
DEPT. PLANT AND SOIL SCIENCES
UNIVERSITY OF MASSACHUSETTS
AMHERST, MA 01003 U.S.A.
FAX NO.: 413-545-3958

WE ARE TRANSMITTING 3 PAGES INCLUDING THIS COVER PAGE.

PLEASE CALL 413-545-9662 IF YOU DO NOT RECEIVE ALL PAGES OR IF TRANSMISSION QUALITY IS POOR.

REMARKS:

TOM,

HERE'S A DRAFT COPY FOR THE MORAINE PORTION OF THE PROJECT, WE STILL NEED TO SELECT a STARTING DATE, AND DISCUSS HOW THE TNC WILL CONDUCT FIELD CHECKS

IF YOU HAVE ANY QUESTION FEEL FREE TO CALL ME AT (413) 545-9662

THANKS

TODD NUERMINGER

Present { Christin Fauteux, Rita Russell, Kim Rothley, Sasha Clifton, TC, Lloyd Raleigh, Peter Morgan, Dick Johnson

Harriers => patch size
but patch size for plants, inverts
characteristics of surrounding area

importance of edge effect - avoid drift
- umbrella spp

Dick: Need more data on inverts (lepidoptera) for such work.
Lloyd: Early records show meadows along shore line - probable aboriginal fire

Group: select other key communities + representative spp

Kim: Mark Anderson / historical / empirical approach to DD
functional patch size

Group felt - as compromise - that we should have corroborating umbrella spp for ea. component of sandplain (xeric, not wetland) community.

After listing community types, they were lumped to capture general structure and to accommodate an umbrella spp (see next pp).

~~Some~~ Others spp to consider after these min. viable patches were derived are also listed (mostly rare or declining spp)

Criteria for an umbrella spp were that ea had to reasonably have a viable breeding population on MV (even if migratory), ~~and~~ but not a population that had to ~~be~~ be required (e.g. upland plover). In the case of uplands + ~~grasshoppers~~ - their presence might be an indicator of suitability, but not a viable breeding population as a goal.

Also alternates coarse filter ~~indicator~~ umbrella

Mgt - Issues
A "checkagainst" for rare spp

All xeric/terrestrial communities

Oak PP woodlands - encompasses dry oaks
Grass ~~Heath~~
Scrub oak shrubland
Oak stunt shrubland
Maritime shrubland
PP/Oak barrens
PP/Oak Savanna
Tall Grass prairie
Dry oak forest
Heath

For spp that have a viable breeding population - even if migratory - but not spp whose "viable" population is regional

~~[illegible]~~ Indicator spp

Macro — Closed woodland [forest] — Veery, Scarlet Tanager, Cooper's
Open [woodland] — Whippoorwill
PC { [High shrubland (Oak) — a % of viable mammals (A)
Low (Maritime) Heathland — " ~~[illegible]~~
Low shrub / heath — (1) Coastal (3) heathland cutworm sandplain (2)
grassland — S. e. owl, upland plover, grasshopper
(3) Regal fritillary (4)

Other spp to consider after min viable patch derived for above spp:
- Woodcock
- Bobwhite
- Brown Thrasher

(A) Double check against (falling under umbrella of) Metarranthis apiciaria
Ptichotis bistrigata, Gerhard's underwing,
Imperial moth (pines)

(1) Where hardest to get communities will be (grass)
work back from there to shrubland
Put best sites in conservation land

<u>Next steps</u>

(1) Sasha (or someone else) gets best available information on min viable patch size + population for key spp.

(2) Kris Rothley (or Terry or others) create fire + salt overlay to find ecologically most likely places for:

Grass / heathland (low)

Maritime shrubland

Oak shrubland

Open woodland

Closed woodland (potential old growth + other closed forest)

in that order. That is, starting from the rarest to more common woodland types

(3) Using GIS find ~~minimal~~ minimum viable patches for

BCs

S.E. owls

Grasshopper sparrows

Harriers

Whippoorwills

- start with ideal ecological sites
- see what is available w/ conservation holding
- see what of those holdings needs to be restored
- or see what needs to be acquired, undeveloped + restored by TNC (esp of conservation partners <u>unwilling</u> to restore or manage for spp)

(4) Run ea data set by partners

Min. viable patch size + pop'n for ea Reference spp

His Ripley's process map

The composite Min. viable landscape

- as data develops

(5) Meet again to discuss in fall (October? November?)

(6) Repeat process for

Old growth woodland (see Wendy Artley's up-coming Thesis)

Watershed protection

(not necessarily in that order)

R: we also need to think of landscape functions beyond min viable size of breeding population, e.g.:

- neotropical migrants in maritime heath + native woodlands
- watershed functions

Rhys -

Really need your comments on harrier optimal patch size referenced in Cathy Gonzalez' report

110,000 m² (11 hectares) - guarantee nesting sites - or viable for harrier

No stat diff in preference for Maritime shrub & S. oak

No " " in fledgling success either

Fledgling success in higher (1-1.5 m) vegetation

Dick - work through SMF?

Ron Mobery - whippoorwill - & pun debrief.

Call him re realistic deadlines by end of next week

(604) 929-9619 (h)

(604) 291-3954 (w)

5-31-14

Irene Huber, 2000 Summary Report on Photo Interpretation of Plant Communities and Land Use for the Sandplain Region Martha's Vineyard, MA. Natural Resources Assessment Group, U Mass. ~~For TNC Island Program~~

Spring 2000 - 27,000 ac area

1993 photos 1:12,000 Sewell color IR

Defined boundary by 100' contour line

Overlays 9x9"

There is to be a separate Moraine project area photointerpretation (Janice Stone did these per 6-20-2000 corr.)

Also previous Wetlands Conservancy Program MA-DEP project Plan to transfer + georeference all

Wetland classes used + adapted to TNC types

Upland communities used TNC Nantucket veg mapping project (2000), MA NHESP Priority Community List (1999) and TNC National Veg Class System (1998)

Classification for MV Sandplain includes 3 PP and 3 Coastal Oak types not on ACK. Plus developed special modifier to describe mixed exotic evergreens overtaking natural habitats

30% used for mixes; 70% for dominance;

PP types add SO, Mixed shrub, heath, oak when >30%

MEC - Mixed exotic evergreens where overtaking

Minimum area = 1.0 acre Vernal pools 0.25 ac.

Fieldwork - NRAG staff established photosignatures in field

— over —

From notes looks like Deborah Swanson did field checks for TNC and TNC field tech verified classification of selected sites

June 13-14 Todd Neurminger + Irene Huber (NRAG) accompanied
Bruce Hammond in field. No formal field data sheets needed.
35 check sites for field data
Documentation in NRAG office field books

TNC field tech verified selected sites as photo interp progressed
302 total sites selected 272 verified, 30 inaccessible
Sites indicated on overlays
Most veg photosignatures appear well adapted to classification

Sandplain Grassland occ like Old Field - used location, cut edge or type of [early succ. shrub to differentiate]
Closed SO highly interpretable - bottoms + flats little OSO Open Scrub Oak
Coastal Shrub variable; Heath subjective + transition w/coastal shrub
O-Heath generally conclusive some grading to Maritime forest
O-Mixed not always conclusive; common in transitions wetland to O-H
O-SO highly interpretable esp near CSO
Succ Mixed - not common in this area; difficult to differentiate O-Mixed
Maritime - challenge to see wind + salt pruning
PP-Heath didn't tend to exhibit understory due to tree closure
PP-SO reasonably conclusive understory "In general, shadowing may confuse
PP-Mixed subjective due to shadows understory differentiation in all 4 PP types"
MEE fairly conclusive but challenging where PP exists
PP + Cedar tough to separate

Notes from Bob Zaremba 2002 Notes 6-15-14
Trip to MV

Holly - he finds these very unusual 30' tall

Hickory - subdominant on NW of MV 20" dbh. Beech always co-dominant

Black pine - several groves. Only locally naturalized. Frequent in
N Gayhead. Not an invasive

Nyssa - unusual subdominant many areas. Also stunted on bluffs

Coastal Shrub Thicket - used for many areas - wide range - V.b, Ilex vert,
Myrica, Rosa, Prunus

Much beech on moraine. Unlike other coastal hdwd forests.
within Mixed Decid Forest

Many big trees 20-22" nothing comparable on ACK
Warrant attention

Wind pruned communities are regionally important.

No obvious problem with deer browse

Surprising amount of Vib. recognitum + clear separation Viburnum
from huckleberry in forests. Vib - more mesic, nutricots.

Not v. weedy. Celastrus, eleagnus, Lonicera, Rosa multi + rugosa, black pine,
locust, grape, rubus, Rhus

Fire map

6-19

Notes to Incorporat

beech - after 1824 + 1944
Naushon Oaks > beech CC + CRV AW - Gaultheria, Huck, Vacc., Carex penn

SF - Bet, Andro, Deschamp, Prunus, Amelanchr

#spp
Rackam - AW - size makes no diff on spp. least worth grubbing out

Curse of too much money - tidy, over restored

Posy - Beech occ. monodominant - moraine, water bodies

Rob - Plow ↓ ericads, Oak, ↑ H, G, SPG

TNC Veg - mention environment not history

How did forest recover so fast Trends - mesophication

Human - short-term perspective, memory; few decades (five), 19th C (veg cover)

Inertia ?? SF - critical distinction; eliminate spp

Plant pine - Henry Baldwin 1928 Trees of ACK Josiah Sturgis 1847, 52, 55 plant.
12-28-54 couldn't set CVP
HDT Capt Gardiner at Siasconset up to 300 ac Pitch + Norway pine CC + Psyl Frang

Breiby - Old forests Harris, Kloss, SGF, Woods, Polly Hill - Poss OG

Whiting Hill diversity poss. due to Shaker planting; Naushon low div - beech

178+ Hickory; 160 Tupelo; 246+ WO 87 cm; 243+ RO

\+ Katama Plains Preserve
TNC Smith Preserve - SPG natural community Bamford restoration to native

Legacies - Soil imprints: C, nutrients

from land incl. island
McMaster - Islands - lat, distance, separation, size, variation

Salt spray etc. Not causative but maintenance

SPG - Danthonia, Deschamp (OF indicators

For older cohorts
Compare Posy's age structure data with ours / What about Breiby?

transport cost
Rackam - AW - energy source, not timber (DRF timber from off island, fuel from on)

TNC FDEM
TNC "restoration of property's original grassland + woodland habitat
SPG Katama "largest example of native sandplain grassland left on MV
one of THE largest + best SPG"

Other Veg Types to Write Up

Maritime ~~Shrub~~ Dune - Myrica, Arctostaphylos, Gaylussacia, Vacc corymbosum, Hudsonia

Maritime Shrub - Amelanchier, Prunus maritima, Viburnum recog+dent, Rhus cop, Myrica, Rhus radicans, Rosa, Ilex, Clethra, Q vel, Parthe Vacc, Smilax, Lonicera, Celastrus

Mar Heath - Arcto, Hudsonia, Vacc ang, Gay, Myrica, Prunus, Deschampsia, Carex pen, Andropog, Juncus greenii

Accessible Heath - Moshups, West Basin, Katama, Squibnocket, Wasque ?

Sandplain grassland + heathland - Arcto, Hudsonia, Corema, Gay, less Myrica, SO, Vacc

Andropogon, Carex penn, Arcto, Gay

Red Cedar Woodlan - Gay, Arcto, herbs

Rare types and conservation focus

~ All of MV but especially ... maritime, SO, SPG, bird/insect

Save for Conservation + Future
Fire, SPG

MV-ACK Forests

Omand — Squam Forest ACK. Largest + oldest trees on ACK. Nyssa, Sass, Acer, Black Oak
Sprout w/ branches spread from base; often wider than tall.
Hydra - BO 63 wide + 47 ft tall. 52" basal diam. Ganeesh - beech; 67' x 60 tall, 47" bdbh
Titania WO - 76' x 31';

Boland 2011 — Oak diversity MV - 6 spp + 4 hybrids: BO, WO, SO, PO, Dwarf chinkapin, SO - isolated
One of nmost pops of PO; often stools; WO does not obtain grandeur of mainland
BO - most common. Fall cankerworm.
MFCSF - 612 ac. 1908;

Busby et al. 2008 — Figure - sheep + deer over time + tree ages
2 age pulses - beech: after 1824-27 logging for 50 yrs + after 1944 hurricane
Some established every decade. Qa up to 351 yrs. Estab · late 1700s + for few decades ~~esp in~~ after 1820. Qv 1820-60 108-196.
Much Fagus release 1944
O-B widespread at Eur settlement; decline O + ↑B: selective logging; but clearcut helped it; No cutting last 150 yrs; lack of fire; high freq of moderate wind events;
No O regen after 1944; herbivory - Raup O+H heavily

Lowell Holly, Quisset, Whiting Hill

Busby et al. 2009 — Beech distribution. Uncommon on coast but occasional monodominant. Most common on moraines + near water bodies - drought + fire. Few stands > 5 ha; Naushon ~1000 ha
Wind leads to local dominance. CC - 19 stands; not prefer AW; pref on SW
Whiting - pH 5 + higher CA; Naushon - WO 355
More common - inner CC, Eliz Is, W Moraine MV; did occur on Outer CC as settlement
Regional decline ~1000 BP [Fire sensitive - but sprouts]

Jordan-WAP 2003 Fire dependent PP-SO; 1938-1994 ↓ fires + sizes; ↓ barrens; 1995 severe fire ↑ barrens
most on old Ag. Will go to forest unless. Transition matrices.
Fire line intensity = temperature flame lengths; fire severity (duff consumption);
fire duration, interval, season, fuel. Most LI - spring before leaf out
but duff moist so little removal. Summer - deep duff. Root damage + total
kill - severe growing season > dormant season.
SO - eliminate w/ 3 cuttings/burns. PP by v. intense summer fire
If enough grass - fire every 2-4 yrs
Freq low intensity surface fire favors oaks over RM
Difficult to speculate on fire causing SPG or CH as most on former Ag land
SO, Vacc, Gay - may be removed by Ag

Motzkin et al. '99 CT Valley SO-PP Don't just manage for barrens; include OG PPSO + WP; may
need mechanical treatment besides fire;

Donato et al. 2006 Good regen on no salvage; logging reduced regen; logging ↑ fire risk; incongruent
w/ fuel reduction goals; Need specific fuel reduction work. Allow dead trees to
stand and decay. Logging can be counterproductive - may conflict w/ ecosystem recovery goals - removes regen + ↑ surface fuel loads

Eberhardt et al. 2003 CACO - Wooded at settl., 44% cleared Plowed for field pasture; 42% never cleared; 14 open
POG on AW; Plowed - more P, ↓ O, few ericads, Deschamp + Arcto; Ag generated extensive
heathlands + grasslands w/ much reforesting; fire affects canopy comp + structure;
Hyp - fire controls landscape pattern. Woodlots in outer central area Wellfleet Pitted Plain. Fences on bay side
with some outer. 20% Eastham, Wellfleet, Truro remained wooded.
POG - Pteridium,
High fire presettl. but no descriptions of herbaceous veg - dunes, bluffs, villages
clearing, land use + fire. Arcto, Schizachyrium, Descham persist in oldgrass forests

Forests

Eberhard POG - Gaultheria, Vaccinium pallidum, Gay - Epigaea establ. little in former Ag

Exceptional fire tolerance of woodland spp explains why presett fires didn't

generate extensive heath + grass, These may have occurred in regen. woodlands.

Need to mimic Ag - remove woody + scarify; better in old field areas - former

Foster et al MV 2002 Differences in fire history moraine + outwash;

Landscape scale variation - long-standing - soils + geomorph.

Rapid reforestation of moraine; moist soils, abundant seed source; modest ↓

Beech, hickory + ↑ O + P around Harlock

SPG habitats not major Indian areas? Meadows + salt marsh not fields

Slow succ on coast - dry, wind, salt, limited dispersal / seed source.

Julie Lundgren, Lesley Sneddon, Mark Anderson, Bruce Hammond, Tom Chase

1999 ACK TNC Veg Class SPG, SHeath, Mowed grassland, PP-SO Woodland, PP Mixed Shrub Woodland salt spray variant

Most often within reach of coastal winds; influence of winds

SPG - Schizachyrium, Carex penn, ~ Arcto, Gay + shrubs Mowed Grassland

SP Heathland - Arcto, Hudsonia, Corema, Gay + less Myrica, Vacc, SO

PPSO - variant

PP Mixed Shrub Woodland - Gay, Vib, Arcto, Myrica usually near develpd

SO Shrubland - Open vs Closed

Maritime Forest - stunted; Mixed Planted Evergreens, ~~Red C~~

Red Cedar Woodland - incl. Gay, Arcto, herbs

Mixed Decid - Oak, Sass, Nyss, RM stable soils - mesic to droughty; broad

Coastal Shrubland - Vib, Gay, Prunus, Amel, Myrica

Wooded Swamp

In combination with MNHESP mapping - Janice Stone

Plots 20x20, 10x10, 5x5

No mention of history; mention edaphic, wind, salt spray, frost bottoms

overwash,

Wildlife

Ecology w/ lots on grassland/shrubland/cultural

Bellemare + Moeller — Herbs + Climate change. Endemics, small ranges, low abundances, slow movement innate ecology, new spp, contractions. Mapped to get concentrations of small ranged taxa. Dispersal limitation. Rel. little migration + range expansion in Holocene.

Berlik - Illusion

Foster 2000 — What is its history. Cons Challenges. Importance of history. LT + retrospective studies. Evaluate LT process, increase sample size, rare/extreme events, contrast cultural regimes (NE forest trend), insights lags/leg. Tale of 2 LTER sites. Complex (many factors; changing at settlement); cultural influences; change can be rapid + ongoing; Wildland/Woodland/Cultural

Costanza, Graumlich, Vander Leeuw — I Hope — Emergence, sustainability, decline or collapse of human societies. Examine ways people interact w/ nature + its changes. ① Map changes biophysical + human change on Earth last few centuries; ② understand + test model ③ develop credible options for future

Stephen Meyer — Extinction debt. Land transformation, pollution, biotic consumption. Too little, too late. Bioreserves too small + too isolated. Document earth's biota + protect broad ecosystem functions + processes in a dynamic environment around hot spots. Inject spp. Need mgt

Faison et al. 2006 — Dry open oak - persisted 2000 yrs; dry + warm; low lakes; local occurrence - SNE; Ambrosia - annual; Walden Pd 1850 best analog; higher fire;

Prentice 2010 — Human pop'n + fire often opposites; climate a major factor

Foster 2002 — Geographical generalization. History - new data + perspectives to ecological Q; Historical data are surprisingly good; Huge spatial + temporal variation in landscapes;

Ecology - 2

LU Legacies
Foster et al. 2003 — History of LUQ + HFR; persistence of ancient land use;
Absence - large trees, snags, uproot mounds, unimodal ages, structure - forest, beach
Multi-stem trees; successional spp; homog of veg.
LU = editor + may open to opportunistic spp.; soil imprints; soil carbon
+ nutrients; N; Woodlots + grasslands; Loading of N on enriched sites;
Natural disturbance doesn't necessarily generate natural responses;
Selectivity of grazing is important; bison to bring back sheep;
Lengthy legacies even when left alone + natural reintroduced
Future legacies - additional caution for modern actions.

Wildlife
Foster et al. 2002 — Early succ. spp - reptiles, amphibians, cottontail, woodchuck
Grass height, density, woody, extent
Peabody 1839 Report on Ornithology of MA.
Hunting v. effective when pops low.
Spp in different trajectories not equilib. Some well estab, some just established,
Instantaneous snapshot of spp on v. diff trajectories. Some not here yet, some
expanding.

Thoreau's County
Foster 2002 — 3 directions - Wildlands, Woodlands, Ag, Illusion biodiversity
Huge opportunity given landscape; weave areas geographically
Conduct historical studies; define explicit goals + rationale; scientific framework
for assessment; sustain mgt + assessment; reassess
challenges + limitations - can't return; many options; transience; future Δ inevit
Some impossible. Eternity behind + ahead

Do Nothing
Foster-Orwig 2004 — Create bigger impacts + problems than fix. Ecosystem function continues thru hurricane impacts
and bugs. Greater impact from N, harvesting + pre-emptive. Also generate important

Foster/Orwig Salvag — Generate important structure - what is missing in our woods.
Valid reasons for mgt including pre-emptive + salvage; state explicitly, follow prescription + ecological forestry.
1938 hurricane, Hurricane Expt; No ecosystem impacts; HWA + Hem Expt;
Protection hypoth never tested; allow trees to get big + die;
Cope with novel analogous disturbances; No fire; fine fuels;

Barkham 2013 — British countryside - looks intact + beautiful but Armageddon; Wales has lost 99% hay meadows; beauty ↑ in places; nonnative spruce
Forestry Commission removes conifers from AW; folly of coniferisation; overall better woods; Children inside
Plant natives - battle in people's hearts + souls

Hodder et al. — Large herbivores in wildwood - naturalistic grazing; could have shift balance from shade-tolerants to oak; no evidence for half-open woodlands; nor required for oak
Animal welfare considerations; ideal but impossible to achieve;

Gotmark 2013 — 4 mgt alternatives: (1) minimal intervention (2) traditional - favor biodiversity + past cultural landscapes (3) non-traditional - specific tree species, OG charact. (4) spp mgt keystone etc. + rewilding w/animal spp. Often >1 correct conservation option.
Much conserved forest + increasing but little guided by plans
#2 challenging - few relevant studies

Askins et al. ? — Grassland bird cons. - frequently outnumber woodland spp on endangered lists - drought, grazing, fire, beavers, native grazers
Can maintain some on working lands; Agricultural intensification biggest cause
Bobolink, E Meadowlark - declined t/o entire range
Northeast - fire, wind, insects, disease, beaver; sandplains - fire;

Ecology

Askins — Beaver meadows support Bobolinks + Savanna Sparrows; completely ignore the historical period; 15 obligate grassland spp -

horned lark + vesper sparrow - sparse veg w/ bare ground

grasshopper. somewhat sparser grassland often w/ bunch grass - LBS/Danthon

Savannah, Bobo + E Meadowlark - wider range of grasslands including dense rhizomatous hayfields with exotics like timothy

Upland Sandpiper - range but like heterogeneity

Henslow + short-eared owl - thicker, moist grasslands

Regional survey NY-NE - Sav + Bob (~70%) most common > E Mead (≥7%) > Upland, Vesper, Grasshopper + Henslow (<2%)

Private land largest habitat; blueberry farms; public land less but many spp esp important for Upl Sand - large area;

Surface mines; reclaimed 35,000 ha in PA w/ GB

Pop'n sink if mowed early or too frequent

Moderate grazing good for Henslow + Grasshopper 0.12-0.24/ha cattle

Westover - Upl Sand + GHS ↑ 200% w/ mgt

Fire good (cites vickery)

Interpret overall dynamic as loss of native habitat + adjustment to artificial habitat

Britain farm programs include nutrient stripping

US Farm Bill Grassland Reserve Program

Grassland Birds MAS www — Project started 1993; Site + links not maintained

NE Grassland History - Scat openings - river floodplains, wetlands, beaver meadows, salt marshes, coastal SPG + CH; 1800s - widespread; GHS, SS, VS, US, EM, B

Jones Shriver

Ecology

2001
Jones, Shrier, Vit   MAS Regional Inventory NY-NE Grassland
75% 73% 45% <20%
SS > Bo + RWB > EM > VS, GS, US, HS

1145 sites

MAS www   Managing for birds (Instructions)   Upland Sandpipers + Grasshopper need 100 ac.

Mowing small Hayfields

Small (10-75 ac.) Mow after Aug 1; every 1-3 yrs

SS + EM raise 2nd brood that may fledge in late July; or leave small unmowed areas;

Maintain some with bare ground - killdeer + horned lark - small intensive

Hay production - mow early + discourage birds

Use flushing bars; raise bars 6"; don't mow at night

Adjacent fields >> isolated

Grazing Small Pastures

Mosaic; esp. KD + ML; Intensive ↓ plant diversity + cover

Small + intensively grazed unsuitable for most nesting spp.

Keep ~40% at 8-12" until Aug 1 by rotating; some ungrazed

Burn

every 2-6 yrs w/ adj. unburned; burn before Mid-May

Large Grasslands

1998
Foster/Motzkin   No static baselines: Quotes Wm Wood; Josselyn; Dwight   (Landfills on MV)

8 best grassland sites - airports, military bases, land fill, drained cedar swamp to grassland for ag ind, military training ground, 2 semi natural

Legacies - AW/SW will endure thru mgt

Kluft + Ginsberg
CCNS ORV
2009   Inverts
> spp + abundance, more wrack; Kill, reduce habitat

Ecology

2009
Paul Elias notes — Livestock mgt widely used; all serious conservation includes it as livestock impacts were widespread; target-spp biodiversity; mosaic

deer, rabbit (Myxo), ponies, sheep, cattle + less pigs + goats

Wildwood 7-4K BP; AW

Trampling is important; swaling = burning

Tradeoffs / tensions - rough country adaptation + traditional methods vs meat production + economics; No shelter

Butchering in fall maintains the lower pop'n in winter. ½ load

Our overgrazed wood: savanna + park woodland

Small wood easier to manage

Penikese — DFW owns 75 ac. 1800s turkey, sheep, rabbits raised — 1873 - Agassiz - Anderson School Natural History

Now - gulls, terns, Leach's storm petrels

David Starr Jordan 1st flora 1873 - later Pres of Stanford.

219 spp 47% aliens; ↑ shrubs + vines

Gosnold - covered w/ cedars - should return to that - 1999 1st cedar

No ericads; ferns ↓

Pasture spp richness
Tracy / Sanderson — 17 farms PA → CT → VT; over time grazing does not ↑↓ richness;

Soil P inversely related; seed bank, stochasticity

Generally Poa, Trifolium, Taraxacum

Grazing intensity related — Most of diversity - transient plants

ACK — Middle Moors - despite LT mowing few grassland associated spp in. Seed banks have few grassland spp. So harrow + add local grass + wildflower seed.

2004
Einfenmyer — Salvage

2003
Raleigh et al. Sandplain Toolbox - SP communities: G, H, Shr, dwarf pine plains, barrens, woodlands + forests.

Prescribed fire is a necessary part; grazing; mowing (initially expensive), clearing, herbic

Great overview of northeast sites

2009
Karberg + Beattie ACK Sheep Grazing Prescribed grazing

Munford 2011 Yale
Fire/Grazing. Debate in literature fire vs grazing Best - River Audubon Center

Herbicide, fire + graze. Supress Festuca (fire-intolerant); fire ↓ N

2007
Askins et al. Shrubland songbirds. Plot-level variables are important - tree density and veg height more than surrounding area + shrubland area.

E Towhees more abundant in larger openings. Negatively related to veg ht.

Even small forest openings provide habitat - e.g. for Blue-wing Warbler

Oehler 2003 State efforts to promote early successional — G, S, ESF clear habitat goals also hindering;

Agencies charged with conserving all native wildlife.

Mowing most common in Northeast; timber harvest infrequent; resource limiting factor

Up to $486/ha.

Burning potentially better, more cost-effective; rarely used

Should do more timber harvest No.

No mention of Ag.

2013 Deer-problem - ↓ Wood Thrush ↓ cover Cats - 1.4-3.7 billion birds annually
MAS State of Birds - Loss of Ag Lands, Grasslands, Shrublands

Meadowlark, Kestrel, Sav Sparrow Brown thrasher - shrublands

Many woodland + forest spp ↑ Grazing beneficial - insects

Meadowlark - Since 1971 400,000 ac crop + pastureland - 150,000 converted
Pop'n ↓ 76%; cats, intensification, chemicals neurotoxins

Ecology

Review by Askins
R Fuller Book

All about management of artificial habitats; farmland birds - would be called grassland, shrubland, wetland spp in NA

Admits NA spp. have thrived in cultural landscapes.

2013 Statewide Action Plan Upland SP + GHS w/ Vesper Sparrow

Increasingly airports, landfills + military instillations - uncertain future; push for solar; focus on id sites; approach on sites that grass is primary objective

If focus on USP + GHS others will come.

Heavy grazing - nest failure for some; cold season grasses bad for some

Pre-history - coast + river valleys; post-glacial grassland?

Endemic northeastern grassland endemics - E subspp Henslow + Savannah

Indians, beavers, coastal grasslands;

While forest is natural; open, early succ. habitat has always been important.

1996 - 2010 GHS, UPS, VS ↓ ENA - -4.85%, -3.36%, -2.58%

Annual Declines
9.6% E Meadow
6.2% Kestrel
4.9% Field
3.1% Sava.

↓ popn 87%, 78%, 68%; MA - largest popn Westover

Many MA sites - less than 10%

UPS - generally need 125ac and this only supports few GHS (75)

Need burning, mowing, herbicide +/or low intensity grazing.

Little Blue Stem + Indian Grass warm season so mature later; mow late

UPS - once widespread, common - market hunting + habitat loss; 4 eggs, single brood + flight in 30 days arrive mid april depart July + August - Pampas

GHS - Carribean + Mexico; warm season bunch grasses 4.3 + can double brood feed 9 days then flightless + dependent 3-4 weeks

Westover - premier site - largest GHS, UPS in NE; 2nd tier - Mass Military, Nashawena, Westfield-Barnes, Fort Devens, Hanscom Field, Plymouth Airport, Logan Airport; 3rd tier Frances Crane, Southwick + capped landfills.

Top Priority for Restoration - Frances Crane + Southwick - as owned by conservation groups (DFW)

Ecology

Southwick - Former tobacco farm 163 ac. grassland + moderate GHS; 196 ac. adjoining-

CT DEP - managed for grassland birds

Francis Crane - moderate GHS; occasional UPS ~175ac may be

doubled through restoration; adjacent Mass Military 2000 ac

Nashawena - 600 ac. grassland lower due to ownership; 2nd highest GHS

Bolton Flats - 150 ac. DFW

Climate Change - Little impact next 100 years

MV sites - Airport (409 ac.); Katama (286); Gosnold (A+B 216 169);

Westover; MMR; Nash; Westfield-Barnes; Fort Devens; Hanscom; Plymouth

Airport; Logan; Crane WMA; Orange Air; Turners Falls; Cumberland

Farms; Southwick WMA; MV Airport; Worcester; Katama; Eliz Is; Moore Airfd,

Clinton Landfill; S Weymouth Naval Air; Eliz Is B; Bridgewater Correctional;

Worcester Landfill; Amherst Landfill; Shepley Landfill; Bull Hill Rd;

Montague; Mass pa Lnd fill etc.

Askin 1998 Forest disturbance "restoration" to create shrublands. Why restoration?

Shrubland birds - steep declines past decades. Fires + beaver

Depend on artificial habitat but considerable evidence were more widespread

Shrubland spp find these patches easily.

Towhee consistent rapid decline. 87% ↓ in SE winter habitat

Biggest driver - Ag ↓, but region forest not prone to disturbance

Beavers, hurricanes; giant mammals; Indian fire + Ag;

Natural - beaver, fire, allow defoliators; clearcuts; utility ROW;

Askins 2008 Unpopular habitats;

Ecology

MAS 2013 Killdeer - cats, people, pesticides   Still common

VG 2014
Rob Culbert MV mostly wooded: clearing; 1880 ~5000 sheep: similar now to presettlement

Dave King Shrubland birds - 41 in northeast; warblers + sparrows; 7/10 federally endangered songbirds; big declines - (brown thrasher (↓ 90%), E towhee), (golden-winged warbler, yellow-breasted chat (↓ MA gone))

Habitat has increased in ME but many spp don't get there;

Arguments against: Not historically present; weedy spp;

Megafauna; grassland + shrubland spp in middens; hurricanes; fire; Indians; largely coastal where suburbanization has pushed them out;

Need logging; Powerlines = 0.61% of shrubland habitat in MA need to be > 50m; Need 3 ac openings

Avoid edges; small patches;

Fire

Mouw 2002 — Before 1955 - 1000+ ac fires frequent (<20 yrs); since 1955 - more freq but <4 ha led to ↑ oak woodlands ↓ SO

Later successional development + fire roads ↓ fire occurrence; more fuel but less exposure of fuels to wind + drying - closed canopy structure of veg.

Less chance catastrophic fire; Potential for 1000 ac windy spring fire.

Nothing will stop but 200 ft no fuel + 500 ft modified fuel will slow fires

Biggest veg Δ - ↑ hdwd - SO 0→533

Declining fire activity over time due to changing veg.

Lack

MVT 11.24.2012 — Fire partnership burning at Long Point - MAS, TNC, PHA, SMF, TTOR

2011 DCR MFCSF — Fire Control + Fuels Mgt 1946 5120 ac 1930 5000 ac fires

Last big fire 1965 1200 ac.

Hazard Fuel Reduction, Ecosystem Restoration, Fire Training Mgt objectives

Dave Celino contact — Some extreme loadings - pro-active; mowing + burning

Shrublands - most imp for moths

Fire preferred mgt approach as it is a natural disturbance

Trains Island Fire Depts - cannot be done in a classroom

Smoke Mgt with each fire

Going to burn all Pohogonot 2011-12

WAP — Using fire, grazing, prescribed fire, mechanical

Karberg 2005 — Head of Plains ACK; fire - growing season best time to control shrubs but not grass

2012 fuel reduc. MVTimes-TNC — Chappy - chainsaws on 6 SMF parcels just W of Wasque - Harborview Ave.

Fire

TTOR Burn Brochure - Fire + grazing; fire maintains grassland, heathland, SD, sandplains

Following Eur. Settlement - human disturbance shifted to land clearance, logging, sheep

~~Deer - Naushon~~

~~Veg Age structure~~

~~Floristic affinity to AW - Cape + Montague~~

Fire - Put into making the landscape?
Change with veg structure + LU practices
Map of fires on MV
Wildland-Urban Interface.

Animal LT Dynamics Figure — Importance of identifying 1600s benchmark
Change of spp with habitat, hunting, introductions, use

Grassland + Shrubland birds not identical - figure + map — more broadly plants + animals
Role of Ag — Bees/moths/butterflies

Mgt activities for habitat - Menemsha Hills,

Trout

Osprey - Figure over time; modern map w/successes
Map over time?

Heath Hen - kept alive by genetics discussion + statue; memorial icons

Otter/Skunk/Coon? — Absence of predators: large birds, cats, dogs — Humans

Read Biodiv + Place in Cult/Natural Read; Have Jenny enter

Fire + SPG + CH

ACK Chronicle 11.21.12

Burn to control invasives + restore sandplain grassland. NLB has 25 yr permit from MNHESP to burn for Smooth Hummocks sandplain grassland. 1000 ac of maritime heath burned to reduce SO. Indians + Europeans burned to control weeds, stimulate plant growth, and reduce game bird cover. Need 45-55% humidity sun, cool temp, high mixing height, Follow P. Dunwiddie's prescription. Ernie Steinauer. NLB, MAS

irony - reduce SO on ACK

Lloyd Center 2.9.11

ACK - treeless due to sheep + wood collection. 24/39 rare moths in MA in SO barrens, 9 coastal heath 8 + sp grassland 7. Many spp of all types found or restricted to these. Burn, mow to prevent succession. N Harrier, Short-eared Owl. Over 1/3 turnover in macroleps from Kimball 1940s to Mello 2000. Due to veg Δ

7.17.08
S. Oktay 38: Yesterday's Island

SPG - wind, low nutrient, salt spray; S1 - State ranking - critically imperiled. Schizachyrium, Carex pen, Danthonia, Arcto, SO, Myrica penn, V ang, Aster linariifolius, Gay bac; Overlap with but more vasc. spp than SPH.

Rare spp. Amelanchier, Aristida purpurascens, Asclep purpurascens, Viola pedata, Linum intercursum, Liatris scariosa etc.

Outcompeted by Scotch broom - Cytisus scoparius, Polygonum cuspidatum, Euphorbia cyparissias, Fescue, Holcus, Poa, Anthoxanthum.

90% in world - Tuckernuck, ACK, MV · burn, mow, harrow, graze

N Harrier 50-55 nesting pairs NCF largest effort - grazing; hooves

Andrea Stevens - SPG existed before Eur. arrival; Aided by livestock

Karberg 2011
NCF Progress Report

Corema conradii - NS to NJ. Large expanses Middle Moors; due to historic roads promoting it. SO+PP encroaching. Dunwiddie - annual branch counts - 60 yrs; senescent 25-30 yrs; Seedling estab from fire? Sig cover reduction w/ fire. Seedlings established

reeman et al. — E. silvery aster
Mgt impact on Symphyotrichum concolor - ACK only
SPG - Bluestem, Carex pen, Gay, Vang, Arcto → SPH as shrub ↑
Indians → Ag; burn, mow, graze; respond well to burning, but not reproductive fitness; no test of germination or seedling establishment; May need genetics

2009 Karberg + Beattie Sheep Grazing — 2005 Pilot
Sheep clear historical role; but little emphasis; creates interstitial spaces;
Squam Farm - Ag → woods → farm; NE Heritage Breeds Conservancy Great Barrington
19 Cotswolds then 8 Cotswolds + 9 Romneys. (Rs donated by MAS)
Sampling design. Sig ↑ bare ground; historic - continuous over decades + intensive; v. different than mowing; large ↓ woody spp; grazing little on older woody stems; SO - slight increase but not colonization
Native sheep eat woody spp. more aggressively. Best - repeated grazing in growing season + dormant mow ↓ woody vines + shrubs, ↑ grass + bare ground
healthy bushy rockrose + Hypericum St Andrews cross.
Sheep - effective tool - mixed tool box.

Nan. Cons Fdn — ACK Natural Habitats. Diversity - different stages of succession, diff edaphic, land mgt salt exp. SPG - outwash, S part of island. Coastal heath = moors - more huck, Vacc, Myrica, rose - C+N coarser soils. People esp sheep. Succession to SO-PP. PP more where plowed, SO where intact. Barrens where SO expansive. 1847 Joseph Sturgis plowed PP windbreak on Milestone Road
Frost bottoms - shrubs other than SO can't tolerate

DFW Biodiv. 2013 — Ag lands focus - abandoned late 19th + early 20th C - young forest mgt - late 20th C - grassland + shrubland
Many native spp that relied on natural open habitats declining. Habitats ↓ due to houses dams, highways + fire ↓. Use active mgt "to provide. Natural - beaver meadows, scouring, fire: routine disturbances - not wind. ↓ beaver, ↑ dams, ↓ Indians. But ecological irony - ↑ Ag
As abandoned - ↑ whippoorwill, towhee, woodcock, prairie warbler, field sparrow
Beaver not allowed near 2000 miles (feet) of stream crossings

DFW cont. Alarming declines - E Towhee, Field sparrow, Brown thraser; (upland sandpiper, vesper sparrow, grasshopper sparrow.) T or E. NE cottontail; regal fritillary
Black racer, box turtle Blazing star, SP Gerardia, E Silvery Aster.
Field reclamation, Invasive control. Mulching machines.

2002
BI Plan USFWS Piping plover - federally listed; Am. Burying Beetle - federally endang;
Small remaining farms can't support upland sandpiper, grasshopper sparrow; 100 ac
May be sinks; Invasives - Phrag, bitter, autumn, loose, Jap honey; Mute swans; deer, fox, mink, skunk, weasel, gull, crow

TNC - Vineyard Habitat Network. Think of living space as habitat. Not sinks.
MVC-Conslomm pamphlet - use natives, reduce E, water, fert. avoid pesticides

Norton-Jensen 2005 Brush cut vs burn on CCNS P-O; Try to reduce fire hazard, Combine both reduced litter + shrub depth + load; Prescribed fire since 1985 - longest in NPS - aim to reduce fuel load and depth of ericad shrub.
PO forest - Fire adapted trees + shrubs
CCNS sig wildland fire interface - > 600 houses, businesses etc. Similar veg + fuel loading as LI + NJ. 1995 - 9500 ac in 2 fires in LI in 2 days. several houses 1957 Plymouth Co 15,000 ac 2 days

Schizachyrium scoparium C4
Peterson C-13 C3 vs C4 plants - No LBS grassland on Kohlberg site for 150 yrs
Greater C in grassland soils

Carol Knapp + Debra Swanson
Boland Conservator + MV Flora. MV Sandplain Restoration Project + Collaborative; GIS database 1997
Document spp distributions; invasives spread

Vickery et al. 2002 mowing, grazing, clearcutting + burning; future will involve all

Sandplains

Motzkin et al. | Frost pockets. Bud break, leaf phenology + SO ht strongly related to T°

Shrublands - late-spring frosts + shorter frost-free growing season; chronic dieback of developing leaves, slow growth rates + reduced stem ht;

Extreme radiational cooling ; areas increased with logging;

Topo depressions + openings ; positive feedback to disturbance;

Lower T; freezing in open not forest; mid May - big delay bud burst;

Even-aged aftr 1986 fire; 1.5-1.7m vs 2-3 m; may affect for 30-60 yrs;

Not just cold air drainage; extreme radiative cooling; actually greater than nearby depressions; with forest;

2014 - Quansoo - lvs regrown by June 15
MFCSF - Freeze ~ June 15

Q ilic - highly frost sensitive; near N range; feedback; short SO experience greatest frost + die-back; central portion greatest frost; early refs - few on frost bottoms + SO thickets - MV shrubbed plains + barren ragged plains; Mid 19th c. - many acorn bushes - HDT frosty hollows; died down annually - fescue, sweetfern, oak shrubs, hazel;

As SO taller - less damage; trees will emerge; cut overstory

Alternative community state

Albany Pine Bush
Gebauer 1993 | Historical fire regime disrupted; new mgt but few quantitative info; need more history

Karner blue; Inlands barren buckmoth; Ceanothus americana; Lupinus perrinus;

2003
Foster/Motzkin | largely forested; extensive areas only developed w/ Eur LU; assemblages have no long history; decline over centuries related to ↓ in LU; all cons. area w/ openland assemblages experienced intensive LU; modern distrib, comp, structure largely determined by LU; doesn't diminish their importance + aesthetics; does suggest that should be managed w/ hist LU

Cultural so dynamic; some veg + structures not permanent; need History, Ecology, Mgt, monitoring;

Deteriorating ; high biodiversity + aesthetics

Sandplains

F+M 2003 Natural disturbances don't make openlands;

Barrens, plains + openwoodlands - ambiguous

Often degrading. Short rotation logging, burning, grazing. Benefits grasses

No long-term integrity - indeed continually changing. Weed flora origin - Marks

Novel ecological opportunity + environ history; Disturbance dependent

Nutrient depletion - Tiffney

Increasing use of sheep + cattle.

Clarke 2006 Rare spp - central plain; almost never in undisturbed (decades) shrublands + woodlands

do occur in openings esp. w/ ↓ duff + ↑ lichens; Firelanes have rare spp -

Scleria pauciflora, Aristida purpurascens, Linum intercursum, Nabalus serpentarius,

Sisyrinchium fuscatum Vary in disturbance / plowing response. Plowing +

repeated mowing created suitable habitats for 5 rare spp.

Most rare plants at N edge of range not endemic + globally rare

Many in cemeteries, roadsides, powerlines, gravel pits; occ. shrubland + forest/

MFCSF - ~~some~~ of largest occurrences in MA of each spp + more ~~total~~ rare spp than

many natural areas.

Plowing + mowing as or more successful than burning + grazing

2007
Hermy + Verheyen Legacies in modern biodiversity; Ancient Forest Species

Dispersal most critical factor - more so than recruitment

Breiby 2004 Mature woodlands; MV - (separates Ancient (no coppicing) from Mature) primary, ancient, mature; some pit + mound;

Veg + Breeding Birds Mature - Menemsha Hills; Harris; Kloss/Ganz; PHA; Seven Gates
Ancient - Whiting Hill, Seven Gates; CTN; Woods

Many sites are primary, some may be OG

246 yr old WO; 243 RM; Silvics 30 to 200; RM ~150

CC
Motzkin et al. 352 plots woodlands, barrens, grasslands + heathlands

O-P-H, P-O-Hairgrass, Bearberry-SO, PP-SO

LU, Geog, Soils - eg Arcto-SO on sites disturbed; PP-SO + O-P-H largely primary

Hemileuca maia — Barrens Buck Moth
LCP
Haggerty 2006 MFCSF; SP Barrens = Fire dependent system; catastrophic fire due to LT fire suppression; Goal: reduce fire hazard + create natural open habitats

Phytophagous Leps: feeding success at larval stage critical, depends on host plant nutrients, ability to reach optimal feeding T, predator avoidance

MFCSF - >20 (zz) regionally rare insect spp; Hm = species of special concern;

Hm - N range feeds ~exclusively on (both) SO; S range feeds on many oaks

SP succ systems maintained by hurricanes, grazing, fire, salt + logging, mow, plow

Some spp only NE examples; some prairie spp;

~1 century of fire suppression; ↓ grasslands + shrublands at MFCSF

Orig firebreaks - harrowed ↑ grasses; shrublands support the Leps

Hm - where SO densities highest incl small patches w/in any veg except PP + Plants (1x1 m plots) where SO low; growth ↑ w/ ↑° canopy free; So manage to keep open SO

DCR 2013 Red pine removal Myles Standish: RP scale Matsucoccus resinosae + Diplodia pinea

Remove; restore native PP-SO + PP barrens; protect people, reduce fuel (hazard)

Reserves: allow for ecological restoration + mgt to provide rare sp habitat + ↓ fire risk.

Standish ↑ aesthetics, ↓ debris ↑ recreation Paul Gregory, Bill Hill

Sale - whole tree harvesting + chipping; if only remove dead + dying uneconomical

if remove all - cover larger area - economically viable + preferred

Need DCR Commish for > 1/3 ac harvest all merch. trees

↑ open veg structure - cold air drainage

Fire Mgt
Montague 2003 Ken Clark + WAP - 1512 ac - Protect lives, perpetuate PP-SO complex, encourage

fire ecology research + training restore health of ecosystem + sustain it;

Barrens Buck Moth - black w/ white band on wings; black cater w/ yellow

marks + spines Common in S; threatened in MA

E Box Turtle

Bruce Sorrie list
MV Airport Rare Spp. 13 E, T, SC or Watch List - SPG - rare in MA but not so rare at airport

Airport surveyed into areas taking account of these and others -

Barrens Buckmoth, Purple Tiger Beetle potential etc.

Grasshopper sparrows as 175 ac. grassland + savanna sparrow,

field sparrow, meadowlark 2 nesting pairs GHS 2003

Saw Tiger Beetles but no PTB

Pop'n of BBMoth

Moved popns of Aristida purpurascens + Sisyrinchium arenicola

Mitigated SO area as also took BBM

Hawthorne 2004 Pelham - 3 levels overstory thinning + burning to reproduce qualities of

fire-maintained oak woodlands ↑ Vacc w/ openings

Fielder 2005 SO ↓ with fire control; high dens'ty of SO in topo bottoms

Used Hobos, Depressions - lower T° than forests. Lower Min T°

Trees - slower growth rate in SO areas. SO grow as well

Sandplain

Fielder — SO amount in MFCSF 1938-1205 ha; 1952-1139; 1995-601; 2002-348

Deep Bottom 7.1m; Willow Tree 5.6m, Pohogonot 5.7m, Airport 6.2

Note 2003
Tim Simmons — Purple Tiger Beetle aka "cow path tiger beetle" needs taxiways, runways and scarified areas

Grasshopper Sparrows - terrible cat, skunk, racoon impacts

TTOR Cape Poge — Gull predation. skunk, dogs

TTOR Long Pt — Threatened by tree encroachment; thinning 12 ac; then burn + mow; will improve for Sandplain flax, False-foxglove, Blue-eyed grass, Bushy rockrose, Gerhards Underwing Moth.

Fuel Mgt-Plains
2005 WAP

Literature on Land Use Legacies in Vegetation

Broader Context – Why do we care about land use legacies and ecological history?

Chazdon, R. L. 2008. Beyond Deforestation: Restoring Forests and Ecosystem Services on Degraded Lands. Science 320:1458–1460.

Short perspective paper that looks at reforestation in a global context and discusses some of the complications in attempting to restore forest ecosystem structure, functions, and services in secondary forests. Particular focuses on how much assistance may be required for restoration depending on the system, context, and history.

Foster, D., F. Swanson, J. Aber, I. Burke, N. Brokaw, D. Tilman, and A. Knapp. 2003. The Importance of Land-Use Legacies to Ecology and Conservation. BioScience 53:77.

Makes the case that past human land-use leaves a surprisingly persistent mark on ecosystems that ecologists and conservationists cannot ignore. Draws on a wide range of examples from the LTER network and beyond, which collectively lay a foundation for trying to understand the likely long term effects of current and past land use in the future. One of the conceptual foundation papers of the land use legacy literature.

Jackson, S. T., and R. J. Hobbs. 2009. Ecological Restoration in the Light of Ecological History. Science 325:567–569.

Another perspective on restoration, this one emphasizing the importance of historical and paleo ecology in setting restoration targets. In spite of the fact that ecosystems are rarely stable (i.e. moving targets), ecological history is useful in answering questions about which historic ecosystems provide viable targets and which drivers of global-change require that alternative ecosystems be considered.

Swetnam, T. W., C. D. Allen, and J. L. Betancourt. 1999. Applied Historical Ecology: Using the Past to Manage for the Future. Ecological Applications 9:1189–1206.

A primer of historical ecology and its applications in management. Examples from the U.S. southwest, but within a broader conceptual context. States a primary aim of historical ecology as finding the ecological and evolutionary limits of communities and ecosystems that should guide and constrain management action.

Review, Synthesis, and Theory – What do we know about vegetation recovery from past land use?

Bowen, M. E., C. A. McAlpine, A. P. N. House, and G. C. Smith. 2007. Regrowth forests on abandoned agricultural land: A review of their habitat values for recovering forest fauna. Biological Conservation 140:273–296.

Forest recovery from a critter perspective. Global review that sums up findings on multi-scale structural and functional attributes of post-agricultural forests necessary for faunal recovery. Outlines research questions needing further attention.

Cramer, V., R. Hobbs, and R. Standish. 2008. What's new about old fields? Land abandonment and ecosystem assembly. Trends in Ecology & Evolution 23:104–112.

Lays out a conceptual framework for our understanding of post-agricultural succession, drawing on a wide range of literature. Discusses the role of abiotic and biotic stress, community assembly processes, and land use intensity in determining post-abandonment successional trajectories.

Flinn, K. M., and M. Vellend. 2005. Recovery of forest plant communities in post-agricultural landscapes. Frontiers in Ecology and the Environment 3:243–250.

Review of land-use legacies among herbaceous forest understory communities in Europe and North America. Emphasizes the role of population and community-level processes, species life-history traits, and dispersal versus recruitment limitation in recolonization. Interesting perspective from below the canopy.

Hermy, M., and K. Verheyen. 2007. Legacies of the past in the present-day forest biodiversity: a review of past land-use effects on forest plant species composition and diversity. Ecological Research 22:361–371.

Quirky paper, similar to Flinn and Veland 2005, but with more of an emphasis on the mechanisms behind recolonization. Focuses on the traits of species associated with ancient (i.e. old-growth, primary) forests and on the question of recruitment versus dispersal limitation, concluding that spatial dispersal limitation is usually more limiting.

Olden, J. D. 2006. Biotic homogenization: a new research agenda for conservation biogeography. Journal of Biogeography 33:2027–2039.

A review of the current state of knowledge of biotic homogenization, its causes, and its importance for conservation. Discusses knowledge gaps requiring better understanding of mechanisms, consequences, environmental determinants, community properties, and spatial scale and extent. Conceptually oriented. See also Olden & Rooney 2006 Global Ecology and Biogeography 15:113–120, for a more methodologically-oriented paper about quantifying biotic homogenization with further discussion of definitions and some good references.

Vellend, M., K. Verheyen, K. M. Flinn, H. Jacquemyn, A. Kolb, H. Van Calster, G. Peterken, B. J. Graae, J. Bellemare, O. Honnay, J. Brunet, M. Wulf, F. Gerhardt, and M. Hermy. 2007. Homogenization of forest plant communities and weakening of species-environment relationships via agricultural land use. Journal of Ecology 95:565–573.

Really neat meta-analysis of studies comparing ancient and modern forest beta diversity, finding modern forest understory communities to be more homogenous, with weaker species-environment relations than those in ancient forests. This study really sets a good standard for these sorts of questions, and has a nice, concise discussion and a number of potentially useful references.

Significant/Interesting Regional Studies

Tropical

Chazdon, R. L. 2003. Tropical forest recovery: legacies of human impact and natural disturbances. Perspectives in Plant Ecology, Evolution and Systematics 6:51–71.

Review of interactions between land use legacies and natural disturbances in tropical forests. The 'Legacies of human impact' section is particularly good and relevant.

Colon, S. M., and A. E. Lugo. 2006. Recovery of a Subtropical Dry Forest After Abandonment of Different Land Uses. Biotropica 38:354–364.

A landscape-scale comparison study of Puerto Rican forests with different land use histories. Found substantial recovery after 45 years in a number of attributes, but compositional differences persisted.

Grau, H. R., T. M. Aide, J. K. Zimmerman, J. R. Thomlinson, E. Helmer, and X. Zou. 2003. The Ecological Consequences of Socioeconomic and Land-Use Changes in Postagriculture Puerto Rico. BioScience 53:1159.

A Puerto Rican analogue to Foster et al.'s work in New England on land abandonment and subsequent forest recovery. Puts the Puerto Rican case study in a wider tropical forest context.

Norden, N., R. L. Chazdon, A. Chao, Y.-H. Jiang, and B. Vílchez-Alvarado. 2009. Resilience of tropical rain forests: tree community reassembly in secondary forests. Ecology Letters 12:385–394.

Study testing niche versus neutral theories of forest community assembly in post-agricultural succession in Costa Rica using long-term sapling and seedling data. Evidence favored the niche-based equilibrium model. Good integration of both theory and conservation implications.

European

Baeten, L., M. Hermy, S. Van Daele, and K. Verheyen. 2010. Unexpected understorey community development after 30 years in ancient and post-agricultural forests. Journal of Ecology 98:1447–1453.

Examines the independent effects of long term land-use history and recent chronic environmental change by resurveying ancient and post-agricultural forest understories in Belgium. Found that while all communities changed over the course of three decades, with reduced diversity and altered relative composition, land use history effects persisted and were stronger. Thus, the trajectory of post-agricultural community development does not appear to be converging with ancient forest composition. Interesting discussion of extinction debt and colonization credit and other concepts of post-agricultural community development.

Dupouey, J. L., E. Dambrine, J. D. Laffite, and C. Moares. 2002. Irreversible impact of past land use on forest soils and biodiversity. Ecology 83:2978–2984.

Finds differentiation in plant communities and soil properties based on intensity of Roman-era land use at a site in France, suggesting that land-use legacies may be irreversible on historical time scales. See also Dambrine et al. 2007 Ecology 88:1430–1439 for a similar study finding Roman-era impacts on patterns of biodiversity at broader scales and Plue et al. 2008 Landscape Ecology 23:673–688 for a study finding evidence of vegetation homogenization and soil alteration-induced seed bank effects at Roman occupied sites.

Peterken, G. F., and M. Game. 1984. Historical factors affecting the number and distribution of vascular plant species in the woodlands of central Lincolnshire. Journal of Ecology:155–182.

This is the classic, granddaddy paper looking at land use legacies in Europe by comparison of ancient and modern forests. A bit long-winded, it still has some interesting findings and insights relating to (re)colonization, island biogeography, fragmentation, community assembly, and dispersal versus recruitment limitation.

Smart, S. M., K. Thompson, R. H. Marrs, M. G. Le Duc, L. C. Maskell, and L. G. Firbank. 2006. Biotic homogenization and changes in species diversity across human-modified ecosystems. Proceedings of the Royal Society B: Biological Sciences 273:2659–2665.

A study using fine-grained, broad scale vegetation survey data collected during a period of land use change in Britain to test assumptions about biotic homogenization. Found a positive association between α diversity, habitat similarity, and trait variance, suggesting the ascendance of successful traits among a small number of community-specific specialists. Interesting application and discussion of biotic homogenization concepts, with a good dose of theory.

Eastern North American
(additional papers worth consideration)

Flinn, K. M., M. Vellend, and P. L. Marks. 2005. Environmental causes and consequences of forest clearance and agricultural abandonment in central New York, USA. Journal of Biogeography 32:439–452.

Study on the feedbacks between past land use and the physical environment, asking whether differences in soil and topography between farmed and unfarmed forest patches reflect land use preferences or land use effects. Land use decisions do appear to be influence by physical factors, yet primary and secondary forests had substantial overlap in soil properties, suggesting that patterns of plant distribution in forests of varying history are more strongly influenced by dispersal processes than environmental alteration.

Fuller, J. L., D. R. Foster, Jason S. McLachlan, and N. Drake. 1998. Impact of Human Activity on Regional Forest Composition and Dynamics in Central New England. Ecosystems 1:76–95.

This study is already cited in our paper but deserves more attention, as it provides some really important context for what we look at. Namely, that forests in central New England were changing and homogenizing prior to European settlement in response to climate, natives, and other disturbances. Insightful discussion and a lot of good references to the wider literature on North American vegetation change.

Larsen, C. P. S., B. J. Kronenfeld, and Y.-C. Wang. 2012. Forest Composition: More Altered by Future Climate Change than by Euro-American Settlement in Western New York and Pennsylvania? Physical Geography 33:3–20.

New paper from Wang and company comparing the magnitude of forest change from past land use to that caused by modeled future climate change in areas of NY and PA. Suggests that a doubling of CO_2 will cause less change, but with 3.5x CO_2, compositional change will be greater than that caused by Euro-American land use legacies.

Rhemtulla, J. M., D. J. Mladenoff, and M. K. Clayton. 2009. Legacies of historical land use on regional forest composition and structure in Wisconsin, USA (mid-1800s-1930s-2000s). Ecological Applications 19:1061–1078.

Assesses the trajectory of deforestation and forest recovery in WI. Suggests that forest recovery in the north may stall due to certain taxa lagging in their recovery. In the south it is the absence of the historical disturbance regime (fire) that has stalled recovery. Also finds evidence of homogenization, particularly in central WI, which is biophysically more like the north, but has land use history more similar to the south. See also Schulte et al. 2007 Landscape Ecology 22:1089–1103, which we already cite, but is probably the closest mid-west analogue to our study (i.e. region-scale) so is probably worth another look. Both have good, integrative discussions.

Rooney, T. P., S. M. Wiegman, D. A. Rogers, and D. M. Waller. 2004. Biotic Impoverishment and Homogenization in Unfragmented Forest Understory Communities. Conservation Biology 18:787–798.

Cited already for methodology, but not content. Fifty-year resurvey of intact forest understories under different management/protection in northern WI, looking at community change among different functional groups. While regional diversity was maintained, site-level diversity decreased due to the replacement of native specialists with generalists and exotics, also leading to homogenization. Deer pressure is a likely cause. Discusses conservation implications.

File 5-26-15 ①

Was more mesophytic forest ↓ w/clearing
critical distinction
/ vast areas w/ few remnants of ~~people~~ - stonewalls
larger ~~trees~~

5-12

Sieve
wood/seed sources/
resprouting/fire/
tolerance
favored oaks
Odgen quote →
same spp but less
of more common
better woodlands

① Forest Development over Time
Map-② Lands from the 19th Century

AW vs SW Emerging over time - 1850 → present:

1850 defined broad outline - since - fragmentation + perforation

AW defines oldest trees → age structure

" " lack of fewer cultural features

Broad distributional patterns - AW × Substrate (Geology Type)
" × Town/Place

Forest types

Distinctive forests -

Mesic: Beetlebung, Red Maple, Beech; Divers - Mixed

Oak: Oak-Heath; Oak-Scrub Oak; Scrub Oak

Pine: Pine-Oak; Pine - 1850 map w/ Pine - heaviest on Chops

Plantations - Mortensen + Mack: Picea abies regenerating up to 46m; larger than
Pg; Pinus syl regenerating highlight lib pp
Young reprod, freq seed crop, light; Pinus thunbergii S Beach

Forest Characteristics

Missing Species - WP, AW, Chestnut, ash, tulip, basswood, elm? black yellow? birch, white birch
Added Species - Tsuga, WP, spruce, blacklocust; odd habitats
Missing Structure - OG, Uproots, snags,

Legacies + structures - homog unimodal age, multistem, soils + fertility, C, N

Enigma of recovery - variation w/ location; Pine vs oak vs succ

Inertia - PP enduring

Peculiar things - exotics, savanna, fire, grazing

Openlands - Heathlands, grasslands, farms + farmland

Fallow

Landscape futures - Succession, Exotics, Mesophication
Inertia - Once something established challenging to remove. Spreads. PP

BioMap / BioDiversity - MVC Biodiversity;

Protection vs Types

Sent to Brian

Vegetation Notes + To-do 7-5-14

TNC Veg Map ~~Need to simplify + make types clearer~~ important

- bin Pine + Pine-Oak

DRF explore Pines - Trade Winds, L Tashmoo - N Pines, Katama - Tower Hill, Deep Bottom, N of Nat's Field,

Brian - Send map of "other forest type" - bin with adjacent?

Distinguish/differentiate - Ag lands,

Distinguish Oak-MS from O-H + O-SO

Age Histograms Fig 6

Show WO scale to 250

Merge Black + Scarlet Oak remove vertical hached lines

Reduce ~~distance~~ spaces between graphs + Drop label into graph at right over "200"

AW vs 2ndy Histogram - Spell out Ancient Woodlands / Secondary Forest

Remove vertical lines

Surficial Geology	MV 35% outwash	33% moraine	20% Outwash/Moraine	
	AW 61% "	19% "	19% "	25%
	% AW 47%	16%		

Notes from "More Notes from C+N" for Forest Section — 5-14-14

File as Read 6-20-14

Posy - Oaks older than beech; beech ↑ over time

Foster et al 2003 LU Legacies - AW - Gaultheria, SO, Huck, V. cass - CRV; Gaultheria, Epigaea, V pallidium CC

Plowed - Polytrichum, Bet pop, Andropogon, Apocynum, Danthonia, PP, Monotropa, Cypripedium, Melampyrum, Rubus - CRV; Deschamp, Andropogon, Chimaphila, Trientalis, Prunus, Melampyrum, Monotropa, Amelanchier

Rackham 1986 AW - least worth grubbing out; size makes no diff; rejuvenate coppice by cutting; Curse of Too Much Money - tidiness, over-restoration

Mouw 2002 ↓ fire allowed less flammable veg.

Foster/Motzkin Fire map 1855 → 200

WAP Harrowing ↑ rare spp along fire lanes

Naushon Lots of references to AWC-, much good timber; 1841 Oct gale - much damag; also 1869 Sept 1898 Winter gale - big fallen trees; 1938 - 1000s of trees but most defective; many good remain so forest grandeur unimpaired; Sept 14 1944 - ~ 1/3 damaged heaviest stands 1/5 trees ~ 30,000 down; 10,000 cds est.

Tree ages - Oldest in AW - depending on cutting history; SW - since 1850

Outline

AW - few cultural legacies; multistem; SO; tree ages × substrate + town

SW -

BioMap/Biodiversity

Protection vs Types

Peculiar things

Openlands - Heathlands, Grasslands, farms, farmland

White Pine

C.S. Sargent 1883. Forest fires. 30th Annual Report State Board of Agriculture of the Massachusetts Agricultural Societies. Wright and Potter Printing Co., Boston.

MA 1880 - 13,899 ac. burned. 3988 ac in Barnstable county.
Dukes < 1000
1883 ~10,000 ac.

Fire destroys the trees and capacity of the land to produce same spp.

If manage long term forests will self-perpetuate; but not after fire

WP - if cut only a portion - regenerates to WP; but after fire - fireweed, raspberries, gray birch, willows → maples, ashes, birch

WP will occupy most of NE freed from plough and scythe

NE - future value of WP on old farmland > profit of all NE farms in the next 50 yrs.

Wooden ware - Winchendon - center of this business in US + World

With exception of redwood belt no N American forest can yield in quantity any substitute for WP the most generally valuable and most generally used of American lumber.

Figures into US property

Single danger is fire.

52 fires by locomotives; 40 from brush heaps; 37 hunters; 19 smokers; 3 charcoal; 8 malice

Questioner - did you ever know a WP forest cutover to come back to WP? No. But that was stated.

Discuss plantations set out in 1840

Chestnut invaluable - produces ties in 25 yrs + sprouts to replace itself.

Changes at time of and since settlement

Recovery

Types

Forests & Conservation – Ideas – 2014

poorest, most common forest most intact working class forests with value as forest

<u>Forest</u>

Dominant cover today –throughout pre-history; most intact part of the landscape.
Undervalued and underappreciated; not hot spot; not heavily disturbed diverse areas.
Low diversity; studies emphasize rich forest.

Pine not widespread concentrated central core MFCSF to N

How did forest recover so fast and heavily seeded trees spread so quickly? Mechanisms? Generalities? Use for restoration? Barren plain, no forest, scraggly woodlands to forest. Not old field white pine (or pitch pine). Few dispersers–squirrels are (were) few. Passenger pigeons? Jays?

Ho – Ancient woods even-aged; former woodlot; oldest trees; sprout clumps–similar age.
Ho – Vast majority early 20th century as ↓ farms, ↑ forest, ↑ coal. Where are stools?

where is there good evidence for this?

Succession. Pitch pine into fields advanced guard followed by oaks dispersed by squirrels, jays, pigeons; many areas lack pines; pure oak and short time. PP widely planted

Legacies

Clues to land-use history – sprouts, stools, growth forms; size; understory; invasives; artifacts; blow down; fire. Tree forms– legacies of past; moldering relics; transient forms. Quansoo, Menemsha Hills, Spring Point,– magical trees– surrounded taller, straight. Cedar Tree Neck– Sassafras contorted. Wasque Pines – wind and salt shaped. Naushon – Beech–tiny to immense; contour-fit oak and beech. Uproots – branches new stems– confined to few species- Red Maple, beech not oak, pine – so more prevalent on Naushon

Forest types – Beech; oak-Huckleberry; oak-Huckleberry with scrub oak; pitch pine-oak.

Forests –history, inertia, trajectory, future; interact with environmental change;

What was pre-settlement forest and how was it changing? How has 400 years of history altered this? What is modern trajectory and what will change this in the future?

General mesophication of forest since 1900. Spp increase that were common in the past.

Associated wildlife dynamics.

Where did fields come from? When Thomas Mayhew arrived – woodlands or open fields ringed with houses? historical reality – regardless of ancient roots, over the last 350 years open lands have been maintained, expanded, shaped and conditioned by colonial agriculture – cutting., clearing, mowing, plowing, burning and grazing.

Assumption – memory or history as far back as one can reconstruct it is the way it was for a longtime – or forever. Rare species – to first knowledge of abundance – generally 19th century. Assume because it was there it is native and more abundant. Species on banged up, disbursed bed sites, eroding bluffs – but bluffs are time transgressive, continually moving so rare species are moving. Into former woodland.

Beech – status. Was it more abundant? Future increase? Constraints on it – fire, hurricanes. Factors favoring it – grazing and browsing

Inertia

Inertia – once something established it is difficult to remove. Tendency to perpetuate. Pines – fluke of e.g. disturbance versus seed source allows to establish. Will grow for 200 years, producing seeds many years and scattering it, likely to perpetuate.
Intro - MCSF tree blows down or horse path through the plain; couple hundreds of yards away pine tree casts seeds that lodge on torn edge of sedge tuft and take root. One hundred and fifty years later the pines stand in a row. Today, mowing along the fire lines is yielding the same impact – pines rooted along the margins.

Secondary woodlands. Critical distinction– gradations of impact (soil disturbance) and original species removal. Eliminate native flora. Inertia in its removal, decline and replacement. Inertia in its recovery and re-establishment. Insertion of new flora. Competition. Change soil conditions, biota, genetics.

do we know any reduction - beech, hickory - Ogden - hickory cabinetmakers

Sieve – elimination of some species; addition of others; preferential enhancement; differential reduction; big nutted species – how fast can move.

Photos: Successional cedars, Secondary woods, Successional pine, Open oak, Open oak in younger forest, Sprout woods, Hurricane trees, Stools. Gaylusaccia clones in open pastures.

Pine distribution – what explains this?

Notes for Conservation

Identify MVLB to highlight using records

Peaked Hill Reservation 3-11-2002

132.5 acres, 91 owned.

Will plant Atlantic White Cedar – "Reintroduction: [sic] to Martha's Vineyard.

Pennywise - Only Land Bank property with scrub oak bottom.
Lowest part of Pennywise on Tar Kiln Path – grass due to colder and disturbed.

Baldwin, H. I. 1928. *The Trees of Nantucket.*

Josiah Sturgis – 1847, 1852, 1853 – pine plantations. Sturgis and Gardiner Pine Lands on current State plantations.
H. D. Thoreau 12-28-54. Capt. Gardiner at Siasconset – planting pines on tracks to 300 acres – Pitch and some Norway, from Cape and France (P. sylvestris), couldn't get white pine.

Freeman 1807 Skunk, muskrat, mink, mice, moles, rabbits, others – no deer, fox, squirrels.

Swift & Cleaveland 1903. 1823 – Reconsidered to except hunting of heath hen; $5 fine for Heath Hen – split with poor and complainant. 1842 – Law for preservation of grouse or heath hen be suspended in Tisbury to allow inhabitants to kill, take or sell from December 1-10 – without dogs.

November 14, 1842 – Warrant to prevent illegal hunting and shooters of heath hen first ten days in December.

Committee of vigilance to see that non-residents don't trespass on town rights to shoot heath hens the first 10 days in December. Printed in *New Bedford Mercury and Weekly Register*.

Ancient Woodlands

1872 - W Chop – 1st proposed development "lands mostly covered with forest trees";

1969- SGF sold 32-ac along Indian Hill Road up both sides of Christiantown Road... Land known as "Harry Peakes Wood Lot" "In early days each householder found it essential to have his own wood lot to supply him with winter fuel. Similarly, the Indians required wood lots, and much of the Indian Hill area was so classified. The nearby land now belonging to Amos J. Amaral, for example, was once all Indian wood lots." VG 12-12-1969

Peculiar things we do in the MV Woods

- Clear understory for ticks
- Plant non-natives – Rhododendrons, conifers etc – state forest, wind breaks, diversity, screening, to stop use of trails
- Savannas
- Fire
- grazing

Wendy Breiby. 2004. The Mature Woodlands of Martha's Vineyard, Naushon, Nantucket and Tuckernuck Islands, Massachusetts. Honor's Thesis, University of Massachusetts. Amherst.

Confusion between primary and old-growth woodlands and in definitions of ancient vs mature woodlands. But chose sites across W Moraine that were continuous woodlands in 1848, 1938, and 1993 and had bigger, older trees. Those without too much evidence of human history, mound and pit topo, late successional, structural diversity, varying ages = ancient and those with sprout and more open-grown trees, signs of disturbance = mature. Discussion focus on the unique characteristics of the woodlands and whether "these woodlands can be defined as eastern primary or old growth forest."

No reference to MCSF paper or any others by Motzkin or Foster, which clarify these issues and indicate that MCSF is all primary. Cite Cogbill on Wachusett Mt. Does talk of "coppice stools".

Seven large mature patches within least fragmented and rel. undeveloped areas of moraine (except Spring Point) form Menemsha to Cedar tree Neck. Harris, Kloss, Ganz, Seven Gates Corp, Woods and Polly Hill.

Bird data. Three veg plots per bird plot, plus Cruz-all plot; ages at breast height; core woody debris (future report); soils

Talks about an additional publication that will get at management objectives, land-use history and recommendations.

Near Whiting Hill one "ancient" site had old fence and a stonewall so likely sheep corralled. In "mature" evidence of "coppiced" trees (sic – she takes any sprouting to indicate coppicing, which is a land use and management approach not just cutting) and a few possible "wolf" trees.

So, many sites are primary and some may be OG – need more land use history to clarify.

Naushon – lowest diversity – 6.2 spp per plot average vs 12.7-19.8, due to beech. MV ancient had greatest but Whiting Hill had plots with >50 (likely due to planting by Shaler). Tuckernuck high due to open woods. Naushon distinct with most of canopy in subcanopy – dense beech (extreme dominant oak).

Oldest Median tree age – 160+ Tupelo on MV Mature; 178+ Hickory in MV Ancient; 181+ beech in Naushon; 165+ Black Oak on Tickernuck; 151+ Black Oak in Coskata Woods on ACK.

Oldest large diameter trees – 87.6 cm 246+ White Oak in MV Mature; 71.1 cm - 243+ Ted Oak at Seven Gates; 41.9 cm – 222+ Naushon; 21.6 cm – 200+ Black Oak Tuckernuck; 34.4 cm – 128+ yrs Black Oak – Coskata.

Tries to compare with DEM definition – component >than 50% of maximum longevity of spp.

All forests were uneven aged; majority of trees in smaller sizes. Similar BA – 19-24 m2/ha.
Much regeneration. Greatest diversity of regen at MV ancient and mature – not as isolated, wetlands near by.

Platitudes on management. Want to write for landowners and get landowners together to talk about conservation and management. Need work on strategy and ecology and to preserve these

Bird lists of spp.

MV, "Ancient" Bird Species	Average # per plot
Ovenbird	0.7
Eastern Towhee	0.6
Catbird	0.5
Black-capped Chickadee	0.5
White-breasted Nuthatch	0.5
Red-eyed Vireo	0.5
Downy Woodpecker	0.3
Wood Thrush	0.3
Hairy Woodpecker	0.2
Carolina Wren	0.1
Common Yellowthroat	0.1
Prairie Warbler	0.1
Scarlet Tananger	0.1
Veery	0.1

MV, "Mature" Bird Species	Average # per plot
Eastern Towhee	0.8
Catbird	0.7
Ovenbird	0.6
Red-eyed Vireo	0.6
Blue Jay	0.4
White-breasted Nuthatch	0.4
Wood Thrush	0.3
Black-capped Chickadee	0.2
Common Yellowthroat	0.2
Carolina Wren	0.2
Eastern Wood Peewee	0.2
Red-headed Woodpecker	0.2
Cardinal	0.1
American Crow	0.1
Northern Flicker	0.1
Hairy Woodpecker	0.1
Mocking Bird	0.1
Scarlet Tananger	0.1

Naushon Bird Species	Average # per plot
American Redstart	2.0
Red-eyed Vireo	1.3
Black-capped Chickadee	0.7
Eastern Wood Peewee	0.7
Catbird	0.3
Northern Flicker	0.3
Ovenbird	0.3

Coskata Woods Bird Species	Average # per plot
Yellow Warbler	0.5
Cooper's Hawk	2+

Tuckernuck Bird Species	Average # per plot
Eastern Towhee	1
Catbird	0.5
Common Yellowthroat	0.5

Complete List of Ages

MV Ancient

PLOT	spp.	dbh (cm)	dbh (in.)	Approx. no. of rings for median dbh tree	PLOT	spp.	dbh (cm)	dbh (in.)	Approx. no. of rings for largest dbh tree
10M	QUVE	17.8	7.0	37.0	10N	FAGR	49.5	19.5	51.0
22S	SAAL	16.5	6.5	59.0	10M	FAGR	43.2	17.0	63.0
18N	POGR	35.6	14.0	64.0	18N	QUVE	49.5	19.5	79.0
15N	ACRU	27.9	11.0	68.0	22N	QUAL	34.3	13.5	97.0
18S	ACRU	31.8	12.5	73.0	20S	ACRU	63.5	25.0	103.0
11M	FAGR	26.7	10.5	78.0	11S	QUVE	49.5	19.5	110.0
10S	FAGR	33.0	13.0	81.0	18S	ACRU	49.5	19.5	114.0
20S	NYSY	33.0	13.0	94.0	9M	QUAL	45.7	18.0	119.0
22M	QUVE	25.4	10.0	99.0	11M	QUVE	52.1	20.5	122.0
15S	ACRU	34.3	13.5	100.0	18M	QUVE	49.5	19.5	123.0
11N	QUVE	31.8	12.5	113.0	15M	ACRU	38.1	15.0	123.0
11S	FAGR	36.8	14.5	117.0	8S	QUAL	53.3	21.0	125.0
18M	QUVE	35.6	14.0	125.0	20N	QUAL	44.5	17.5	126.0
20M	QUVE	38.1	15.0	125.0	15S	QUAL	39.4	15.5	127.0
21M	QUVE	30.5	12.0	128.0	22S	QUAL	31.8	12.5	132.0
23M	QUAL	34.3	13.5	129.0	22M	QUAL	30.5	12.0	133.0
8S	CRSP	29.2	11.5	130.0	8N	QUAL	45.7	18.0	136.0
22N	QUAL	21.6	8.5	135.0	21M	QUVE	47.0	18.5	140.0
20N	QUVE	31.8	12.5	135.0	21S	QUAL	47.0	18.5	144.0
9M	QUVE	36.8	14.5	140.0	11N	QUVE	61.0	24.0	145.0
21N	QUAL	30.5	12.0	140.0	21N	QUAL	43.2	17.0	151.0
23S	QUVE	27.9	11.0	143.0	23S	QUVE	54.6	21.5	152.0
23N	QUVE	31.8	12.5	143.0	23N	QUVE	48.3	19.0	154.0
9S	QUVE	50.8	20.0	145.0	20M	QUVE	43.2	17.0	159.0
8N	CRSP	30.5	12.0	149.0	23M	QUVE	40.6	16.0	159.0
10N	CRSP	25.4	10.0	165.0	8M	QUAL	55.9	22.0	161.0
15M	QUAL	33.0	13.0	171.0	9N	CRSP	48.3	19.0	165.0
9N	CRSP	38.1	15.0	174.0	10S	QUVE	55.9	22.0	175.0
8M	CRSP	39.4	15.5	178.0	9S	QUAL	64.8	25.5	178.0
21S	QUVE	33.0	13.0	ND	15N	ACRU	71.1	28.0	243.0

Carya ?

MV Mature

PLOT	spp.	dbh (cm)	dbh (in.)	Approx. no. of rings for median dbh tree	PLOT	spp.	dbh (cm)	dbh (in.)	Approx. no. of rings for largest dbh tree
2M	QUVE	25.4	10.0	51.0	2M	QUVE	35.6	14.0	50.0
6N	QUAL	22.9	9.0	51.0	2N	QUVE	47.0	18.5	59.0
7N	QUVE	27.9	11.0	55.0	19M	FAGR	34.3	13.5	59.0
19N	QUAL	20.3	8.0	58.0	7N	QUVE	47.0	18.5	65.0
14M	QUAL	26.7	10.5	60.0	7M	QUVE	45.7	18.0	67.0
7M	QUVE	38.1	15.0	62.0	19N	QUVE	33.0	13.0	69.0
6M	QUVE	29.2	11.5	62.0	4N	QUVE	30.5	12.0	72.0
2N	QUVE	26.7	10.5	63.0	4S	QUAL	21.6	8.5	76.0
4S	QUVE	16.5	6.5	64.0	3N	QUVE	62.2	24.5	76.0
5S	SAAL	19.1	7.5	66.0	6S	FAGR	50.8	20.0	81.0
3N	QUVE	55.9	22.0	69.0	16N	FAGR	41.9	16.5	84.0
12S	NYSY	12.7	5.0	69.0	2S	QUVE	30.5	12.0	85.0
19M	QUVE	22.9	9.0	75.0	5M	QUAL	30.5	12.0	85.0
17M	QUVE	44.5	17.5	75.0	7S	QUVE	53.3	21.0	87.0
3M	NYSY	27.9	11.0	81.0	4M	QUVE	25.4	10.0	90.0
6S	QUAL	21.6	8.5	84.0	16S	QUVE	34.3	13.5	91.0
2S	QUAL	24.1	9.5	85.0	1M	QUVE	73.7	29.0	95.0
1M	QUVE	39.4	15.5	85.0	16M	QUVE	33.0	13.0	95.0
7S	QUVE	40.6	16.0	87.0	17M	QUVE	59.7	23.5	102.0
16N	QUVE	31.8	12.5	91.0	1N	QUVE	72.4	28.5	102.0
1S	QUVE	30.5	12.0	91.0	6M	QUAL	34.3	13.5	104.0
16M	QUAL	24.1	9.5	92.0	3M	QUVE	54.6	21.5	112.0
16S	QUAL	25.4	10.0	93.0	17S	QUVE	77.5	30.5	115.0
4N	QUAL	20.3	8.0	96.0	13M	QUAL	45.7	18.0	115.0
19S	QUVE	30.5	12.0	96.0	13N	QUAL	45.7	18.0	115.0
3S	QUVE	68.6	27.0	99.0	19S	QUVE	61.0	24.0	120.0
4M	ACRU	17.8	7.0	100.0	14N	QUVE	44.5	17.5	120.0
14N	QUVE	30.5	12.0	106.0	14M	QUVE	36.8	14.5	121.0
17S	ACRU	22.9	9.0	108.0	13S	QUAL	43.2	17.0	125.0
12M	QUAL	27.9	11.0	110.0	12N	QUAL	35.6	14.0	126.0
13S	QUAL	35.6	14.0	114.0	14S	FAGR	54.6	21.5	134.0
12N	QUAL	30.5	12.0	120.0	5N	QUAL	34.3	13.5	135.0
5M	QUAL	21.6	8.5	121.0	12M	QUAL	78.7	31.0	138.0
13M	FAGR	31.8	12.5	121.0	6N	QUAL	63.5	25.0	140.0
17N	QUVE	30.5	12.0	121.0	12S	QUVE	57.2	22.5	146.0
5N	ACRU	25.4	10.0	123.0	3S	QUVE	81.3	32.0	152.0
13N	QUAL	25.4	10.0	124.0	1S	QUVE	43.2	17.0	165.0
14S	QUAL	38.1	15.0	129.0	17N	QUAL	87.6	34.5	246.0
1N	NYSY	31.8	12.5	160.0	5S	NYSY	26.7	10.5	ND

Naushon

PLOT	spp.	dbh (cm)	dbh (in.)	Approx. no. of rings for median dbh tree	PLOT	spp.	dbh (cm)	dbh (in.)	Approx. no. of rings for largest dbh tree
27S	FAGR	27.9	11.0	38.0	25S	FAGR	24.1	9.5	47.0
27M	FAGR	24.1	9.5	39.0	26M	FAGR	55.9	22.0	54.0
24N	QUVE	33.0	13.0	42.0	27N	FAGR	34.3	13.5	74.0
24S	FAGR	38.1	15.0	46.0	26N	FAGR	43.2	17.0	96.0
27N	FAGR	19.1	7.5	52.0	26S	FAGR	50.8	20.0	132.0
25N	FAGR	15.2	6.0	60.0	24S	FAGR	53.3	21.0	148.0
26M	FAGR	27.9	11.0	61.0	24N	QUVE	91.4	36.0	165.0
26S	FAGR	25.4	10.0	89.0	27S	QUAL	64.8	25.5	167.0
26N	FAGR	38.1	15.0	128.0	27M	QUAL	55.9	22.0	196.0
24M	FAGR	48.3	19.0	157.0	24M	QUVE	71.1	28.0	214.0
25S	FAGR	21.6	8.5	167.0	25M	QUAL	54.6	21.5	214.0
25M	FAGR	40.6	16.0	181.0	25N	FAGR	41.9	16.5	222.0
					26S	FAGR	54.6	21.5	*258.0

Coskata Woods

PLOT	spp.	dbh (cm)	dbh (in.)	Approx. no. of rings for median dbh tree (inches)	PLOT	spp.	dbh (cm)	dbh (in.)	Approx. no. of rings for largest dbh tree (inches)
30N	SAAL	16.5	6.5	42.0	30S	QUAL	30.5	12.0	70.0
31S	SAAL	20.3	8.0	88.0	31S	QUVE	45.7	18.0	73.0
31N	QUVE	30.5	12.0	109.0	31N	QUVE	55.9	22.0	92.0
31M	QUAL	30.5	12.0	112.0	30M	FAGR	45.7	18.0	98.0
30S	QUVE	24.1	9.5	127.0	31M	QUVE	53.3	21.0	120.0
30M	QUVE	27.9	11.0	151.0	30N	QUVE	34.3	13.5	128.0

Tuckernuck

PLOT	spp.	dbh (cm)	dbh (in.)	Approx. no. of rings for median dbh tree	PLOT	spp.	dbh (cm)	dbh (in.)	Approx. no. of rings for largest dbh tree
29S	Black Oak	17.8	7.0	87	28N	White Oak	24.1	9.5	43
28N	Black Oak	22.9	9.0	99	29S	Black Oak	19.1	7.5	88
29M	Black Oak	15.2	6.0	107	28M	Black Oak	33.0	13.0	117
29N	Black Oak	19.1	7.5	123	29N	Black Oak	36.8	14.5	120
28S	Black Oak	22.9	9.0	133	28S	White Oak	27.9	11.0	192
28M	Black	24.1	9.5	165	29M	Black	21.6	8.5	200

Vascular Species Frequencies

MV Ancient

Common Name	Scientific Names	Frequency
Sassafras	Sassafras albidum	57.0%
White Oak	Quercus alba	57.0%
Catbrier		53.0%
Arrowwood	Viburnum dentatum	50.0%
Virginia Creeper	Parthenocissus quinquefolia	43.0%
Black Huckleberry	Gaylussacia baccata	38.0%
Sweet Pepperbush	Clethra alnifolia	38.0%
Black Oak	Quercus velutina	34.0%
Bristly Dewberry	Rubus hispidus	30.0%
Poison Ivy	Toxicodendron radicans	30.0%
Hophornbeam	Ostrya virginiana	29.0%
American Beech	Fagus grandifolia	28.0%
Black Cherry	Prunus serotina	28.0%
Striped Wintergreen	Chimaphila maculata	27.0%
Hickory species	Carya spp.	26.0%
Red Maple	Acer rubrum	25.0%
Swan's Sedge	Carex swanii	25.0%
White Wood Aster	Aster divaricatus	25.0%
False Solomon's Seal	Smilacina spp.	23.0%
Highbush Blueberry	Vaccinium corymbosum	23.0%
Small White Aster	Aster vimineus	20.0%
Blackberry	Rubus allegheniensis	18.0%
Starflower	Trientalis borealis	18.0%
Wild Licorice	Galium lanceolatum*	18.0%
Big Star Sedge	Carex rosea	17.0%
Roughstem Goldenrod	Solidago rugosa	17.0%
Smooth Shadbush	Amelanchier laevis	16.0%
Common Cinquefoil	Potentilla simplex	14.0%
Elliot's Goldenrod	Solidago elliottii	14.0%
Swamp Azalea	Rhododendron viscosum	14.0%
a sedge	Carex spp.	13.0%
Cinnamon Fern	Osmunda cinnamomea	13.0%
Tupelo	Nyssa sylvatica	13.0%
Wild Geranium	Geranium spp.	13.0%
Winterberry Holly	Ilex verticillata	13.0%
Canadian Mayflower	Maianthemum canadense	12.0%
Dangleberry	Gaylussacia frondosa	12.0%
Indian Pipe	Monotropa uniflora	12.0%
Wavy-leaved Aster	Aster undulatus	2.0%
Wood Anemone	Anemone quinquefolia	2.0%
Bentgrass	Agrostis spp.	1.0%
Big-toothed aspen	Populus grandidentata	1.0%
Black Chokeberry	Aronia melanocarpa	1.0%
Black Locust	Robinia pseudoacacia	1.0%
Early Low Blueberry	Vaccinium pallidum	1.0%
Fall Rattlesnake Root	Prenathes trifoliolata	1.0%
Gooseberry	Ribes hirtellum	1.0%
Heal-all	Prunella vulgaris	1.0%
Pinesap	Monotropa hypopithys	1.0%
Poverty Grass	Danthonia spicata	1.0%
Prickly Dewberry	Rubus flagellaris	1.0%
Rattlesnake Plantain	Goodyera spp.	1.0%
Sheep Laurel	Kalmia angustifolia	1.0%
Skunk Cabbage	Symplocarpus foetidus	1.0%
Smooth False Foxglove	Aureolaria flava	1.0%
Trailing Arbutus	Epigea repens	1.0%
White Baneberry	Actaea pachypods	1.0%
Whorled Loosestrife	Lysimachia quadrifolia	1.0%
Winged or Shining sumac	Rhus copallinum	1.0%
Yarrow	Achillea millefolium	1.0%

Beech Drops	Epifagus virginiana	11.0%
Canadien Sanicle	Sanicula canadensis**	9.0%
Sweet-scented Bedstraw	Galium triflorum	9.0%
Violet species	Viola spp.	9.0%
Hayscented Fern	Dennstaedtia punctilobula	8.0%
Late Low Blueberry	Vaccinium angustifolium	8.0%
Naked Tick-Trefoil	Desmodium nudiflorum	8.0%
White Avens	Geum canadense	8.0%
American Holly	Ilex opaca	7.0%
Indian Cucumber-root	Medeola virginiana	7.0%
Marsh Fern	Thelypteris palustris	7.0%
Spicebush	Lindera benzoin	7.0%
Strawberry species	Fragaria spp.	7.0%
Bluegrass	Poa spp.	6.0%
Eastern Red Cedar	Juniperus virginiana	6.0%
a grass species		6.0%
Wild Sarsaparilla	Aralia nudicaulis	6.0%
Wintergreen	Gaultheria procumbens	6.0%
Wreath Goldenrod	Solidago caesia	6.0%
Flowering Dogwood	Cornus florida	5.0%
Summer Grape	Vitis aestivalis	5.0%
Sensitive Fern	Onoclea sensibilis	4.0%
Beaked Hazelnut	Corylus cornuta	3.0%
Bracken Fern	Pteridium aquilinum	3.0%
Dwarf Cinquefoil	Potentilla canadensis	3.0%
Hairy Hawkweed	Hieracium gronovii	3.0%
Japanese Barberry	Berberis thunbergii	3.0%
Japanese Honeysuckle	Lonicera japonica	3.0%
Oval-headed Sedge	Carex cephalophora	3.0%
Panic-grass	Panicum spp.	3.0%
Pennsylvania Sedge	Carex pensylvanica	3.0%
Pussytoes	Antennaria spp.	3.0%
Rose species	Rosa spp.	3.0%
Solomon's Seal	Polygonatum spp.	3.0%
Spaghnum Moss	Sphagnum cymbilifolium	3.0%
Spinulose Wood Fern	Dryopteris intermedia	3.0%
White-topped Aster	Aster paternus	3.0%
Witch Hazel	Hamamelis viginiana	3.0%
a lichen		2.0%
Bittersweet	Celastrus spp.	2.0%
Red Fescue	Festuca rubra	2.0%
Round-leaved Shinleaf	Pyrola rotundifolia	2.0%
Southern Ticklegrass	Agrostis hyemalis	2.0%

MV Mature

Common Name	Scientific Name	Frequency
Catbrier	Smilax rotundifolia	58.0%
White Oak	Quercus alba	58.0%
Arrowwood	Viburnum dentatum	54.0%
Black Huckleberry	Gaylussacia baccata	53.0%
Red Maple	Acer rubrum	51.0%
Highbush Blueberry	Vaccinium corymbosum	46.0%
Bristly Dewberry	Rubus hispidus	43.0%
Black Oak	Quercus velutina	38.0%
Tupelo	Nyssa sylvatica	37.0%
Sassafras	Sassafras albidum	36.0%
Sweet Pepperbush	Clethra alnifolia	35.0%
Black Cherry	Prunus serotina	34.0%
Dangleberry	Gaylussacia frondosa	31.0%
American Beech	Fagus grandifolia	29.0%
Starflower	Trientalis borealis	28.0%
Poison Ivy	Toxicodendron radicans	26.0%
Smooth Shadbush	Amelanchier laevis	21.0%
Winterberry Holly	Ilex verticillata	20.0%
Swamp Azalea	Rhododendron viscosum	17.0%
Virginia Creeper	Parthenocissus quinquefolia	15.0%
a sedge	Carex spp.	13.0%
Blackberry	Rubus allegheniensis	13.0%
Canadian Mayflower	Maianthemum canadense	13.0%
Striped Wintergreen	Chimaphila maculata	13.0%
Late Low Blueberry	Vaccinium angustifolium	12.0%
Sawbrier	Smilax glauca	12.0%
Bracken Fern	Pteridium aquilinum	10.0%
Red Chokeberry	Aronia arbutifolia	10.0%
Spaghnum Moss	Sphagnum sp.	9.0%
Cinnamon Fern	Osmunda cinnamomea	8.0%
Indian Pipe	Monotropa uniflora	8.0%
Marsh Fern	Thelypteris palustris	6.0%
New York Fern	Thelypteris noveboracensis	6.0%
Small White Aster	Aster vimineus	6.0%
Summer Grape	Vitis aestivalis	6.0%
Wild Sarsaparilla	Aralia nudicaulis	6.0%
Wintergreen	Gaultheria procumbens	6.0%
Hayscented Fern	Dennstaedtia punctilobula	5.0%
Roughstem Goldenrod	Solidago rugosa	5.0%
Trailing Arbutus	Epigea repens	5.0%
American Holly	Ilex opaca	4.0%
Elliot's Goldenrod	Solidago Elliottii	4.0%
Indian Cucumber-root	Medeola virginiana	4.0%
Dwarf Cinquefoil	Potentilla canadense	3.0%
Early Low Blueberry	Vaccinium pallidum	3.0%
Sensitive Fern	Onoclea sensibilis	3.0%
Sweet Goldenrod	Solidago odora	3.0%
Violet species	Viola spp.	3.0%
White-topped Aster	Aster paternus	3.0%
a clubmoss	Lycopodium spp.	2.0%
Hairy Hawkweed	Hieracium gronovii	2.0%
Hickory species	Carya spp.	2.0%
Northern Bayberry	Myrica pensylvanica	2.0%
Panic-grass	Dichanthelium spp.	2.0%
Whorled Loosestrife	Lysimachia quadrifolia	2.0%
Beaked Hazelnut	Corylus cornuta	1.0%
a berry species	Rubus spp.	1.0%
False Solomon's Seal	Smilacina racemosa	1.0%
a grass species		1.0%
Ground Pine	Lycopodium obscurum	1.0%
Marsh Bedstraw	Galium palustre	1.0%

Pinesap	Monotropa hypopithys	1.0%
Pink Lady-slipper	Cypripedium acaule	1.0%
Raspberry	Rubus idaeus	1.0%
Reindeer Moss	Cladonia rangiferina	1.0%
Sheep Laurel	Kalmia angustifolia	1.0%
Swan's Sedge	Carex swanii	1.0%
Water-horehound	Lycopus spp.	1.0%
Wavy-leaved Aster	Aster undulatus	1.0%
White Wood Aster	Aster divaricatus	1.0%

Naushon

Common Name	Scientific Name	Frequency
American Beech	Fagus grandifolia	100.0%
Swan's Sedge	Carex swanii	73.0%
Catbrier	Smilax rotundifolia	46.0%
White Oak	Quercus alba	33.0%
Beech Drops	Epifagus virginiana	31.0%
Black Oak	Quercus velutina	23.0%
Hophornbeam	Ostrya virginiana	19.0%
Bentgrass	Agrostis spp.	8.0%
Creeping Bent-grass	Agrostis stolonifera	8.0%
Smooth Shadbush	Amelanchier laevis	8.0%
Canadian Mayflower	Maianthemum canadense	6.0%
Choke Cherry	Prunus virginiana	6.0%
Late Low Blueberry	Vaccinium angustifolium	6.0%
Slender-spiked Woodland Sedge	Carex digitalis	6.0%
Summer Grape	Vitis aestivalis	6.0%
Wintergreen	Gaultheria procumbens	4.0%
a sedge	Carex spp.	2.0%
Black Huckleberry	Gaylussacia baccata	2.0%
Pinesap	Monotropa hypopithys	2.0%
Southern Ticklegrass	Agrostis hyemalis	2.0%

Coskata

Common Name	Scientific Name	Frequency
Poison Ivy	Toxicodendron radicans	100.0%
	Trientalis borealis	83.0%
	Sassafras albidum	79.0%
Virginia Creeper	Parthenocissus quinquefolia	79.0%
Arrowwood	Viburnum dentatum	67.0%
Beaked Hazelnut	Corylus cornuta	54.0%
Black Huckleberry	Gaylussacia baccata	54.0%
Bristly Dewberry	Rubus hispidus	50.0%
Dangleberry	Gaylussacia frondosa	38.0%
Sweet Pepperbush	Clethra alnifolia	33.0%
Black Oak	Quercus velutina	29.0%
Catbrier	Smilax rotundifolia	29.0%
White Oak	Quercus alba	25.0%
Tupelo	Nyssa sylvatica	21.0%
Blackberry	Rubus allegheniensis	17.0%
Carolina Rose	Rosa carolina	
Raspberry	Rubus idaeus	17.0%
Sweet-scented Bedstraw	Galium triflorum	17.0%
Whorled Loosestrife	Lysimachia quadrifolia	17.0%
Wood Anemone	Anemone quinquefolia	17.0%
Bracken Fern	Pteridium aquilinum	13.0%
Summer Grape	Vitis aestivalis	13.0%
Gooseberry	Ribes hirtellum	8.0%
Sawbrier	Smilax glauca	8.0%
Wild Morning Glory	Calystegia sepium	8.0%
Black Cherry	Prunus serotina	4.0%
Fox Grape	Vitis labrusca	4.0%

Tuckernuck

Common Name	Scientific Name	Frequency
Arrowwood	Viburnum dentatum	
Black Huckleberry	Gaylussacia baccata	100.0%
Bristly Dewberry	Rubus hispidus	92.0%
Poison Ivy	Toxicodendron radicans	92.0%
Virginia Creeper	Parthenocissus quinquefolia	92.0%
Black Cherry	Prunus serotina	88.0%
Beaked Hazelnut	Corylus cornuta	75.0%
a sedge	Carex spp.	67.0%
Sassafras	Sassafras albidum	63.0%
	Smilax glauca	63.0%
Black Oak	Quercus velutina	58.0%
White Oak	Quercus alba	58.0%
Starflower	Trientalis borealis	50.0%
Northern Bayberry	Myrica pensylvanica	29.0%
Red Chokeberry	Aronia arbutifolia	25.0%
Blackberry	Rubus allegheniensis	21.0%
Cow-wheat	Melampyrum lineare	21.0%
Hickory species	Carya spp.	17.0%
Whorled Loosestrife	Lysimachia quadrifolia	17.0%
Carolina Rose	Rosa carolina	13.0%
Dwarf Chestnut Oak	Quercus prinoides	13.0%
Highbush Blueberry	Vaccinium corymbosum	13.0%
Raspberry	Rubus idaeus	13.0%
Scrub Oak	Quercus ilicifolia	13.0%
American hazelnut	Corylus americana	8.0%
Common Hairgrass	Deschampsia flexuosa	8.0%
Fox Grape	Vitis labrusca	8.0%
Greene's rush	Juncus greenei	8.0%
Rose species	Rosa spp.	8.0%
Sheep Sorrel	Rumex acetosella	8.0%
Sweet Goldenrod	Solidago odora	8.0%
Aster spp.	Aster spp.	4.0%
Dwarf Cinquefoil	Potentilla canadense	4.0%
Elliot's Goldenrod	Solidago elliottii	4.0%
Grass-leaved Goldenrod	Euthamia graminifolia	4.0%
Panicled Hawkweed	Hieracium paniculatum	4.0%
Slender-leaved Goldenrod	Euthamia tenuifolia	4.0%
Smooth Shadbush	Amelanchier laevis	4.0%
Summer Grape	Vitis aestivalis	4.0%
Trailing Arbutus	Epigea repens	4.0%
Wild Lettuce	Lactuca sp.	4.0%
Winged or Shining sumac	Rhus copallinum	4.0%

America's Natural Places: East and Northeast

DAVID H. SMITH PRESERVE AND FIRE TRAIL

On Martha's Vineyard and Nantucket, there is an ecosystem that is extraordinarily rare with only a few other small examples in existence worldwide. The coastal sandplain ecosystem in the David H. Smith Preserve on Martha's Vineyard is the most substantial of its kind on the island. Located in Edgartown, this 830-acre preserve features coastal grasslands and heathlands as well as the rare plants and animals that call this beautiful ecosystem home. The preserve is also known for its fire trail that educates visitors about the importance of prescribed burnings to restore and protect this threatened natural area. It is estimated that 80 percent to 90 percent of the world's coastal sandplain ecosystem is located on Massachusetts islands.

this is MFCSF

15 ac

The coastal sandplain ecosystem includes sandplain grassland natural communities. A sandplain grassland is a flat area comprised of native grasses and shrubs and is maintained by periodic burning. These grasslands were formed from melting glaciers many thousands of years ago when the glaciers dropped their sand, and the streams from the melting water formed sandy plains. The deep sand deposits beneath the grassland allow water to percolate down quickly. Due to this high sand content of the soil, water and nutrients drain away easily, creating a climate that is perhaps prone to drought but also creating this very rare natural community. Wildflowers such as bluets, false indigo, asters, and field pussytoes often grow in this area. Coastal heathlands have grasses and some of these flowers as well, but they also contain shrubs such as blueberry, bayberry, huckleberry, and pasture rose. Rare animals such as the short-eared owl, northern harrier hawk, endangered moth species, hairy woodpeckers, and the grasshopper sparrow have recently made a comeback to Martha's Vineyard due to fire management.

Very little of this remarkable ecosystem exists in the world due to residential and commercial development. What does remain has been overwhelmed by nonnative species because of the lack of periodic burning to keep the prairielike coastal landscape open. Until recently, wildfires and burning have been discouraged, because the fire would get too close to homes and businesses. The pitch pine/scrub oak forests have dominated the vegetation in the ecosystem, threatening to eradicate the plants that are characteristic of this ecosystem. The Nature Conservancy has worked with other partners to conduct safe and effective burnings to restore the coastal sandplains at David H. Smith Preserve. There are plans in place for the future to build a research facility at the preserve where further study of this rare ecosystem will take place in order to develop further strategies to restore and protect the coastal sandplains.

Research facility

Restoring the native grassland and woodland habitats at David H. Smith Preserve continue as other progress is made to protect sandplain locations on Martha's Vineyard. Katama Plains Preserve is the largest parcel of sandplain grasslands on the island and is also located in Edgartown. It is closed to the public because of its highly sensitive habitat. The area is small—only 192 acres—but every acre of this natural community that can be protected is critical. The Marine Biology Laboratory and the Nature Conservancy are in the midst of a five-year plan to restore the sandplain ecosystem at Bamford Preserve on Herring Creek Farm. Once used for agricultural activities, Bamford Preserve is being restored to its native state as a sandplain grassland and heathland. Because rich agricultural soils differ substantially from the dry soils of a sandplain, adjusting the soil composition is necessary to support the vegetation that prefers the infertile soils and to discourage the growth of plants that thrive in fertile soils. Because Bamford Preserve connects to the Katama Plains Preserve, restoration of Bamford will safeguard a large tract of coastal sandplain grassland and heathland on Martha's Vineyard.

Further Reading

Dunwiddie, Peter. *Martha's Vineyard Landscapes: The Nature of Change*. Vineyard Haven, MA: Vineyard Conservation Society, 1994.

Mader, Sylvia S. *Martha's Vineyard Nature Guide*. Green Bay, WI: Mader Enterprises, 1985.

MFCSF

YG Editorial — Neglect, ignore, state agency infighting; Vestiges of the Great Plain remain tangled mess;

5 yrs ago HV plan + vision to save Forest - natural state thru clearing

Now state ready - Vineyarders could chronicle for the general. "Could well become the enviro story of the decade" 500 ac to clear

Finally

Agriculture

Lawlor 2013 Thimble Farm - Patch diversity threatened by homogenization - invasive plants + land use. Assess spp distribution + invasives mgt.

Don't consider Swamp part of TF or study.

Mixed oak - Priority habitat MNESP. Clear mgt activities.

Celastrus in E + white poplar; Mechanical + chemical;

Pollinator enhancement areas - Weed control; Invasive spp.

Pollinator corridors; Grassland restoration - spotted knapweed;

Brian 5-12

Send BH Map of dams on Mill Brook

Develop descriptions of databases + maps for book - <u>Metadata</u>

POS - Add columns: % Veg of MV; % of Pos; % of Veg Type that is POS
Do by TNC Broad Type or Physiognomy (what BH did) in POS excel file

Graph - Landcover % in AW; Acres - add % to top of bar;

✓ Tree Ages - Remove Ilex; aspen; red oak; black locust
Add max age above furthest box
Common names
Re-order Oaks (W, B, S); Pine; Hickory; Beech; Nyssa; Maple; Sass; ✓Overall tree-age histogram

✓ HF Vegetation - Re-order spreadsheet × TNC groupings

Veg Map: Oak-Heath/SO; Pure SO; Oak Mixed; Diverse Deciduous; Pine (Pine + Pine-oak); Plantation; Active Ag; Grass/Heath/Shrub/DF; Shoreline

(2) Lands from the 19th Century - Merge Lost AW/Now SW w/ SW
Change color - converted SF; change labels: "Lost" to Converted
Check the Lost AW/Now SF - 2/5/14 has this not 10/19/14

✓ (1) Forest Development over Time
Start 1850; 1850-1890 (40); 1890-1938 (48); 1938-2005 (67)

PP 1850 Map - Check Symbols - verify + densities

MV Veg Literature Notes

Using soil 13C to detect the historic presence of schizachyrium scoparium (little bluestem) grasslands on **Martha's vineyard**. GG Peterson... - Restoration ecology, 2003 –

Abstract We used differences in soil carbon $\delta^{13}C$ values between forested sites and grasslands dominated by the C_4 grass *Schizachyrium scoparium* (little bluestem) to detect the presence of former grasslands in the historical landscape of the coastal sand plain of Martha's Vineyard, Massachusetts, U.S.A. Soil $\delta^{13}C$ was measured at (1) sites with long-term forest or grassland vegetation and (2) sites with known histories where forest vegetation invaded grassland and where forest converted to grassland. The $\delta^{13}C$ of soil under long-term grassland was –24.1‰ at 0 to 2 cm depth and –23.4‰ at 2 to 10 cm and was enriched by 3.4‰ and 2.8‰ compared with soil under long-term forest. In forests that invaded grasslands dominated by *S. scoparium*, soil $\delta^{13}C$ decreased as C derived from trees replaced C from *S. scoparium*. This decline occurred faster in surface soils and in the light soil organic matter fraction than in the mineral soil. In forests that converted to grasslands, soil $\delta^{13}C$ increased and the rate of increase was similar in surface and mineral soil and in the different soil organic matter fractions. Rates of change indicated that soil $\delta^{13}C$ could be used to detect changes in vegetation involving the presence or absence of *S. scoparium* during the last 150 years. Application of this model to a potential grassland restoration site on Martha's Vineyard where the landscape history was not known indicated that the site was previously unoccupied by *S. scoparium* during this time. The $\delta^{13}C$ of surface mineral soil can be useful for detecting the presence of historic *S. scoparium* grasslands but only in the period well after European settlement of these coastal sand plain landscapes.

Abstract

Aim The influence of physiographic and historical factors on species richness of native and non-native vascular plants on 22 coastal islands was examined.

Location Islands off the coast of north-eastern USA and south-eastern Canada between 41° and 45° N latitude were studied. Island size ranges from 3 to 26,668 ha. All islands were deglaciated between 15,000 and 11,000 yr BP; all but the four New Brunswick islands were attached to the mainland until rising sea level isolated them between 14,000 and 3800 yr BP.

Methods Island species richness was determined from floras compiled or revised since 1969. Simple and multiple regression and rank correlation analysis were employed to assess the relative influence of independent variables on species richness. Potential predictors included island area, latitude, elevation, distance from the mainland, distance from the nearest larger island, number of soil types, years since isolation, years since deglaciation, and human population density.

Factors influencing vascular plant diversity on 22 islands off the coast of eastern North America [RT McMaster - Journal of biogeography, 2005 –

Results Native vascular plant species richness for the 22 islands in this study is influenced most strongly by island area, latitude, and distance from the nearest larger island; richness increases with island area, but decreases with latitude and distance from the nearest larger island as hypothesized. That a similar model employing distance from the mainland does not meet the critical value of *P* confirms the importance of the stepping-stone effect. Habitat diversity as measured by number of soil types is also an important predictor of native plant species richness, but at least half of its influence can be attributed to island area, with which it is correlated. Two historical factors, years since deglaciation and years since isolation, also appear to be highly correlated with native species richness, but their influence cannot be separated from that of latitude for the present sample size. Non-native vascular plant species richness is influenced primarily by island area and present-day human population density, although human population density may be a surrogate for the cumulative effect of several centuries of anthropogenic

impacts related to agriculture, hunting, fishing, whaling, tourism, and residential development. Very high densities of ground-nesting pelagic birds may account for the high percentage of non-native species on several small northern islands.
Main conclusions Many of the principles of island biogeography that have been applied to oceanic islands apply equally to the 22 islands in this study. Native vascular plant species richness for these islands is strongly influenced by physiographic factors. Influence of two historical factors, years since deglaciation and years since isolation, cannot be assessed with the present sample size. Non-native vascular plant species richness is influenced by island area as well as by human population density; human population density may be a surrogate for other anthropogenic impacts.

Interpreting and conserving the openland habitats of coastal New England: insights from landscape **history**. DR Foster... - Forest Ecology and Management, 2003 –
Abstract

Maintenance and restoration of grasslands, heathlands, and shrublands are high priorities for conservation due to their diversity of uncommon species and assemblages and their ongoing decline resulting from invasion by shrubs and trees. Much of the literature and management concerning openlands emphasizes burning to control woody growth, based on the interpretation that these habitats and their species assemblages were widespread during the pre-European period as a consequence of natural disturbance and Native American land use. By focusing on the coastal region of New England–New York, which harbors excellent examples of these habitats, is characterized by many natural disturbances (e.g. hurricanes, fire, salt spray), and supported relatively dense Native American populations, we assess the paleoecological, archaeological, historical, and modern ecological evidence supporting this perspective.

We conclude that: (1) pre-European uplands, including coastal areas, were predominantly forested and that openland habitats were uncommon because natural and human disturbance was infrequent and local; (2) extensive openland vegetation developed only with widespread European forest clearance and land use; (3) assemblages occupying grasslands, shrublands, and heathlands apparently have no lengthy history and are comprised of species that combined opportunistically over recent centuries; (4) the decline of grasslands, heathlands, and shrublands is a century-old phenomena related to a decline in agricultural land use, especially grazing, mowing, plowing and burning; (5) effectively all conservation areas supporting these openland assemblages experienced intensive historical land use; and (6) the modern distribution, composition, and structure of these habitats are largely determined by European land use.

Recognition that openland assemblages have cultural origins does not diminish the biological, cultural, or aesthetic value of these habitats. However, it does suggest that grasslands, heathlands and shrublands may be best managed using a combination of approaches that replicate the effects of historical land use. Conservationists should recognize that most of these landscapes have cultural origins and are inherently dynamic; that some vegetation structures and communities cannot be maintained continuously on a given site; and that management is most effective when based on historical and ecological studies leading to clearly defined objectives and rigorous long-term measurement and re-evaluation.

The fate of alien conifers in long-term plantings in the USA
SG Mortenson... - Diversity and distributions, 2006 For more than 100 years, non-native conifers have been introduced into habitats in the USA that already support native conifers. These introductions have yielded few naturalizations and even less evidence of invasions. We investigated the specific fates of nine non-native conifers in an array of introduction sites across the USA (Priest River, Idaho, Wind River, Washington, Cedar Creek, Minnesota, and Nantucket Is. and Martha's Vineyard, Massachusetts) through tree-ring analyses, comparisons of growth with adjacent native conifer populations, and surveys for regeneration and spread. Most of the original non-native tree plantings have died (e.g. *Abies veitchii*, *Pinus densiflora*, and *Pinus halepensis* at Wind River, WA); a few have survived but display low vigour and are not regenerating (e.g. *Larix decidua*, *Pinus mugo*, and *Picea abies* stands at Priest River, ID). *Pinus*

sylvestris recruitment is apparent at all sites examined. *Pinus thunbergii* appears to be invasive on Nantucket Is., although the native *Bursaphelenchus xylophilus* (pinewood nematode) causes high mortality in mature trees. Non-native *Pinus* spp. at the Eddy Arboretum, California and Pack Forest, Washington also experienced high mortality. Dendroclimatic analyses revealed no difference in the effect of climate on the annual growth of native and non-native conifers. Plantations of introduced conifers in the south-eastern USA have died *en masse* (e.g. Harrison Experimental Forest, Mississippi, Olustee Arboretum, Florida). Such widespread extirpations are in sharp contrast to the fate of native conifers in adjacent stands as well as the multiple cases of large-scale conifer invasions in the Southern Hemisphere. Given the diversity of alien plant species that have invaded the USA, the circumstances surrounding the lack of persistence of introduced conifers becomes an important line of inquiry for understanding the factors and circumstances that facilitate or thwart biological invasions.

Griffiths and Orians 2003

Salt spray possible role in heathland development and location. Examined Solidago nemoralis, Myrica pensylvanica, Pinus rigida and Quercus spp distribution and response in greenhouse. Solidago in narrow strip 100-175m from dune crest. Myrica grows within 25 m of crest – not limited. Q ilicifolia 175 m away and pine/oak more than 200m. They interpret zonation as causal.

Common heathland forbs grew closer to ocean than successional woody spp. And spp differed in water status, necrosis and growth response. Solidago peaked closest to water; Myrica also but further away. Scrub oak next then oak and pine. (Zonation not causation).

Quercus consistently lowest xylem pressure. Quercus rubra also had severe necrosis., but Solidago and pine also did.

Pine and oaks more susceptible to salt spray than Myrica. Myrica showed no necrosis in greenhouse but does in field presumably because of other stress and breaks in leaf tissue etc.

Salt spray accumulation on plants – correlated with lowered predawn xylem pressure potential, increased necrosis and short size. Spray may also limit growth of pine (invasive tree species).

Salt spray may exclude or slow succession of woody spp.

They do acknowledge land use a possible structuring factor but probably not important at fine scale examined here.

Chase and Rothley 2007 – Suitable sites for sandplain grasslands/heathlands

Habitats on MV for unusual, rare and endangered spp. Used existing land cover patterns to train hierarchical tree classifier to model 10 biogeoclimatic and positional variables to predict suitable sites for establishment.

Many potential grassland sites are current ag lands, residential development,. Mowed grasslands, commercial development. Could increase area by 67%, buffer areas, join areas.

Many heathland possibilities have ag, residential and later successional forest like maritime forests and pitch pine.. Could increase heathland area by 25% and increase patch size.

Could use historic records to identify sites or models like this one.

Ecosystems occur primarily on exposed sites and near Native American settlements prior to Euro-American land clearing.. Increased dramatically due to ag disturbance through historical period.. Have decreased due to development, abandonment of traditional ag and fire suppression.

MV Grasslands – on excessively well-drained soils in fire-prone areas; dominated by Schizachyrium, Deschampsia and Danthonia. Heathlands – near ocean with influence of offshore winds and salt spray – Arctostaphylos, Hudsonia, Vaccinium, Gaylussaccia, Myrica.

Used bioclimatic factors and included x-y position to account for spatial distribution (near water) to account for land use. Soil wetness (from elevation), Soil perm and organic matter from soil map (?), salt spray-distance from water including salt ponds, fire frequency – based on amt of non-combustible land adjacent (water); frost map – based on expert knowledgeand topo and Soak distribution.

Factor importance – discarded soil wetness and aspect; x position (24%), y position (20%), elevation (8%), frost frequency (6%), soil percent organic (4%), fire, soil perm, spray.

Most sites good for G and H were ag or residential. For H many also maritime forest. These should be both the best sites and the ones easiest to maintain.

If LU and disturbance are the main factors (Foster and Motzkin) then expect model will work poorer. But know that graminoids were common on S shore prior to European arrival – so places where G and H occur are either where they have been for a long time and or are easiest to manage. Thus should be expanded there. Not necessarily causal. Locational factors important but correlated with bioclimatic.

Mortenson and Mack 2006 -- Alien conifers

Little evidence of invasion, few naturalizations. Most did not persist. Priest R ID, Wind R WA, Cedar Creek MN, ACK, MV.

Picea abies is regenerating at MFCSF – up to 46 m from side of plot. Ps trees significantly larger than Picea glauca despite younger. P sylvestris recruiting at all sites – at MV many dead branches and many with heavy infestation of Diplodia pinea. Ps recruits under highest light. Same growth as P rigida. . South Beach – one Pinus Thubergii population.

30% of growth variation in Pinus at MFCSF explained by climate – PDSI – but no other spp. PAR under P sylvestris high at MFCSF

P thunbergii invasive at ACK but native nematode causing mortality – Bursaphelenchus xylophilus. Pt growing around periphery of ACK, spreading in maritime shrublands. Also form ornamentals in yards. Adults heavily parasitized. Few native colonize under the adults – Carex and Rhus radicans. Pt unrestricted by light in regen. Can threaten natives by competitive exclusion and high litter production.

Conifers – low seed mass, young age of reproduction, and large seed crops frequently.

Time lag is spread in S Hemisphere conifer invasions. Same at ACK – Pt planted in 1890s, three generations by 1930.

In general seems unlikely that conifers will become invasive with rare exceptions. Many native pests and parasites though not major cause of failure. Probably not mycorrhizae limited as native conifers have them. Possible founder effect – do well where most abundantly planted.

Not fully understood – as many species, sites, climates etc.

McMaster 2005 Vascular plant diversity islands off East Coast

Island area, latitude and distance for nearest larger island; not distance from mainland – stepping stone hypothesis; yrs since deglaciation and yrs since isolation also important but not able to differentiate form latitude. Nonnatives influenced by size mostly and current human population, which may be a surrogate for history of settlement.

ME islands – bedrock and some high elevations so peaks were left as islands when postglacial submergence – have risen since; then lowstand of 60M at 11,400 BP and so many reconnected.

Assumes that all islands lost spp once islands – loss of area; decline in habitat diversity; and reductions in immigration. Expect that further frag and alteration/destruction of habitat left to other losses.

Dunwiddie – most coastal heathlands on ACk not present before Euroeapn settlement. Many spp associated with heathlands not found elsewhere on the island. PPine present in early Holocene, may have been absent by 19th C. Intentionally reintroduced.

Bird nesting important for non-natives on ME small islands.

3000 BP – Naushon, Penikese, Cuttyhunk connected to mainland by narrow peninsula.

Need to track coastal history and use that to infer.

May get high levels of immigration/extinction today that mask historuical patterns – Penikese turnover of 53-61% over three surveys (!). May not be typical.

High mortality of many invasives at many sites.. No difference in climate response from natives.

Neill et al. 2007. Historical influences on MV veg and soils.

Only 5 plots per type.

Compared dominant 7 veg types on outwash – pine plantations on tilled and untilled; scrub oak, tree oak, burned tree oak and sandplain grasslands. Broad overlap in spp composition. Few non natives. Whereas ag grasslands had high richness and many invasives – Plantago, Holcus, Daucsu, . Woodlands, shrub and grasslands had similar soils but ag grasslands had higher pH, Ca and Mg and N nitrification.

So, no major barriers to conversion among these. But nonnative spp and soils may provide barrier to expand sandplain grasslands or shrublands on these. Could remove plantations to create good sandplain communities with no impact on nonnatives. Nontilled plantations best candidates for this. Need to balance sandplain grassland with rare Leps need for oak woodland and shrubland.

Disturbance dependent and early successional habitats are declining – regional conservation concern.. Sandplain grasslands etc. regional priority. Expanded during land clearance. Can persist through management or restoration and expansion of these habitats. From existing woodlands or ag grasslands. Not clear what impact soil fertility plays.

Sites from High School to EGP and throughout Pohogonot. Coupel of sites on TGP on northeast side.

Ag grasslands – lower richness of natives than sandplain grasslands. Tilled plantations had more but not statistically sig nonnatives.

Broad overlap in composition – e.g., Myrica penn, grass, carex pen, cherry, scrub oak, and poison ivy in all seven and trailing arbutus, Gaultheria, huckleberry, bracken, white oak, Quercus prinoides, black oak, vacc angust, vacc corymbosum, V pallidum occure d in 6/7.

Sandplain grasslands most similar in plant communities to previously tilled pine plantations and ag grasslands.

Recent prescribed burning == no major impact on composition.

Sandplain grasslands more spp primarily due to increase grasses and forbs.

Lezberg et al. 2006 – mechanical land clearing for early succ grassland and shrub did not eliminate woodland spp but did add forbs and grasses.

Peterson and Neill 2003 Little Bluestem C-13

Sites with long term grassland was enriched by 2.8 – 3.4 % in C-13 at 0-2 and 2-10cm depth compared to forest. As trees invade it rapidly drops especially in surface soils. Could detect presence of grassland for 150 years in the mineral layer but only 25 years in the organic. SO can detect grassland after 1850 and has high spatial resolution. Only C-4 plants. Cannot detect other grasses or bluestem > 1850.

On MV grassland restoration site showed that site was not previously occupied by grassland in last 150 years.

2 sites dominated by forest (Smith Forest – TNC) , 2 by grassland (Katama), 2 former grass now forest (North Triangle)and 2 forest converted to grass (Kohlberg Meadow and Correlus firebreak) and unknown on Maiden Lane.

With grassland conversion on ly took 2 years to look like a grassland. Grass to forest change much slower.

"The absence of evidence for historical grassland at a site available for grassland and shrubland restoration raises interesting questions about the goal of vegetation manipulations for conservation of rare and declining species. Our results suggest that creating a S. scoparium grassland or S. scoparium-containing grassland-shrubland on this site may not be a restoration of former vegetation cover but a recreation on this site of vegetation that was formerly more common in other locations."