

A gravel path leads through tall grasses and wildflowers towards a dense forest. The path is on the right side of the image, and the vegetation is on the left. The background is a thick wall of trees.

Resilient Landscapes – in a changing climate

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Sponsors:

ReMain Nantucket

Nantucket Land Council

Main themes

Nantucket island is a distinctive landscape under multiple stresses

Resilience is a shared goal and aspiration

Conventional landscape practices will increasingly depend on horticultural “props” to survive future climate conditions.

Nantucket’s plant communities model resilience - pre-adapted to future climate conditions.

Ecological landscape design presents an alternative approach – and can be beautiful through the seasons – and resilient for the future!



Nantucket Island is a distinctive, unique and fragile landscape

- Post-glacial history, sandy soils: drought-prone, low-nutrient
- Sole-source aquifer is vulnerable to contamination
- Coastal geography exposes Nantucket to severe effects of climate change, sea level rise,
- These stresses also give the island its distinct, memorable character



Issues with Conventional Landscape Design

- Generic Plants “can be anywhere”
- Not well-adapted to inherent “stressful” conditions
- Rely on un-sustainable horticultural “props”
- The water quality crisis
- Displace native ecosystems and plant communities

The Water Quality Crisis

- Many of Nantucket's Estuaries are impaired (algae blooms, fish kills, ...) (MEP, 2006)
- Eelgrass is in decline (N sensitive)
- 60%+- of Nitrate pollution from septic systems (MEP 2006)
- 40%=- of Nitrate pollution from runoff, fertilizers (MEP 2006)
- Ecologically-designed landscapes can be part of the solution!

Species response to climate change in 2100

(increased temperature, more frequent droughts, more intense rainfall)

Tolerators

American beachgrass, bearberry, bayberry, white/black/N. red oak, serviceberry, yellow birch

Losers

pitch pine, white birch, red maple

Candidate Native species for assisted migration

sweetbay magnolia, shagbark hickory, sweetgum, chestnut oak, crapemyrtle, hackberry, pawpaw, persimmon, sourwood.

Ecological Landscape Design for Resilience

Reinforces local landscape character

Beautiful in all seasons

Resilient, water-friendly

Adapted to environmental extremes

Net-positive environmental footprint

Supports local biodiversity

Why are native plants important?

Basis for the food chain

Plants>Insects>Birds

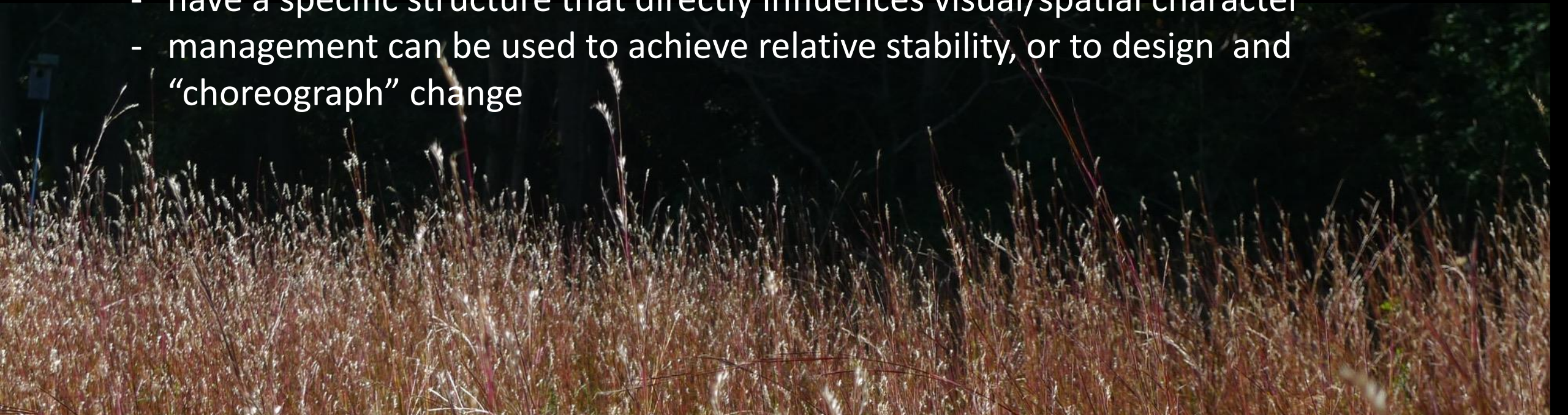
Native insects/Birds are highly selective
“specialists” about what they eat (native plants)



A Plant Community Approach to Resilient Landscape Design

Plant communities:

- “models of resilience”
- have evolved with local conditions/species/ecology
- are adapted to specific growing conditions (sun, soil, water, light.....)
- express local identity and sense-of-place
- have a specific structure that directly influences visual/spatial character
- management can be used to achieve relative stability, or to design and “choreograph” change



Plant Communities

- are the essence of **resilient landscapes**
- require minimal care/maintenance
- self-reproduce
- No fertilizing, No irrigation
- Many are adaptable to future climate conditions

Reinforce regional / local landscape character

- Form/scale of landscape
- Color/texture of foliage
- Synchronicity/Phenology (time of bloom, fruit, fall color...)



Practically every plant species is associated habitually with certain other species... .. If we as landscape gardeners desire to preserve the whole aspect of nature, with all its forms intact, we will keep all plants in their proper social groupings.

Frank Waugh, The Natural Style of Landscape Gardening

How to design with plant communities

- Know your landscape context
- Consider prospective plant communities (species composition, structure, soil, moisture, sunlight)
- Related populations – not individuals
- Cover the ground.....densely.
- Management not Maintenance

Major Plant Communities of Nantucket

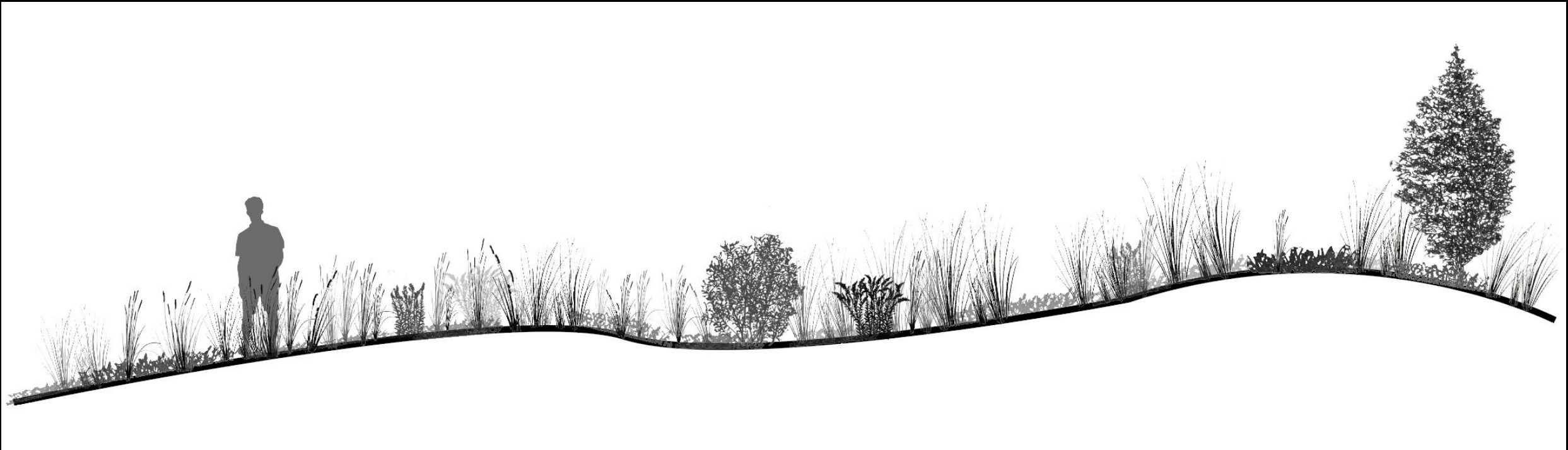
- Dunes
- Sandplain Grasslands/Heathlands/Moors
- Maritime Shrublands/Forests
- Pitch Pine Scrub Oak/ Pine Barrens
- Pine Oak Forest
- Coastal Hardwood Forest



Dunes



Dune Community

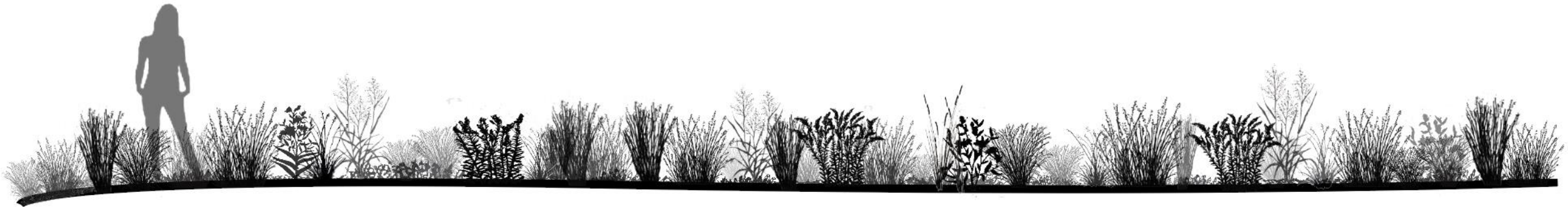


A photograph of a grassland landscape. The foreground and middle ground are dominated by tall, thin, light-colored grasses that appear to be blowing in the wind. Interspersed among these grasses are several upright, green plants with clusters of small yellow flowers. The background is a dark, dense line of trees or shrubs under a bright sky. The overall scene is a natural, open field.

Sandplain Grasslands - Heathlands



Sandplain Grasslands - Heathlands





Maritime Shrublands – Forests



Maritime Shrublands – Forests





Pitch Pine - Scrub Oak Forest, Pitch Pine Barrens



Pitch Pine - Scrub Oak Forest, Pitch Pine Barrens





Pine-Oak Forest

Pine-Oak Forest





Coastal Hardwood Forest

Coastal Hardwood Forest





Plant Community Management (not maintenance)

Gardens are never finished, design evolves with management
expect change, be flexible



Now-mow Fescue Lawn



"Released Lawn"



American Beach Grass

Turf Alternatives



Bearberry



Huckleberry Understory



Lowbush Blueberry (Carlos Montoya)

Turf Alternatives



Hay-scented Fern



Moss Lawn



Sandplain Grassland (Carlos Montoya)

Turf Alternatives



Staghorn Sumac

Rhus typhina

- *Successional species*
- *Outstanding fall color*
- *Foliage texture interest*
- *Spreads horizontally via rhizomes*
- *With sun/space forms large "domes"*
- *Fruit Wildlife value*
- *NOT poisonous (Toxicodendron vernix, swamps)*
- *Undesirable weed?or vigorous successional species?*

Staghorn Sumac

Rhus typhina

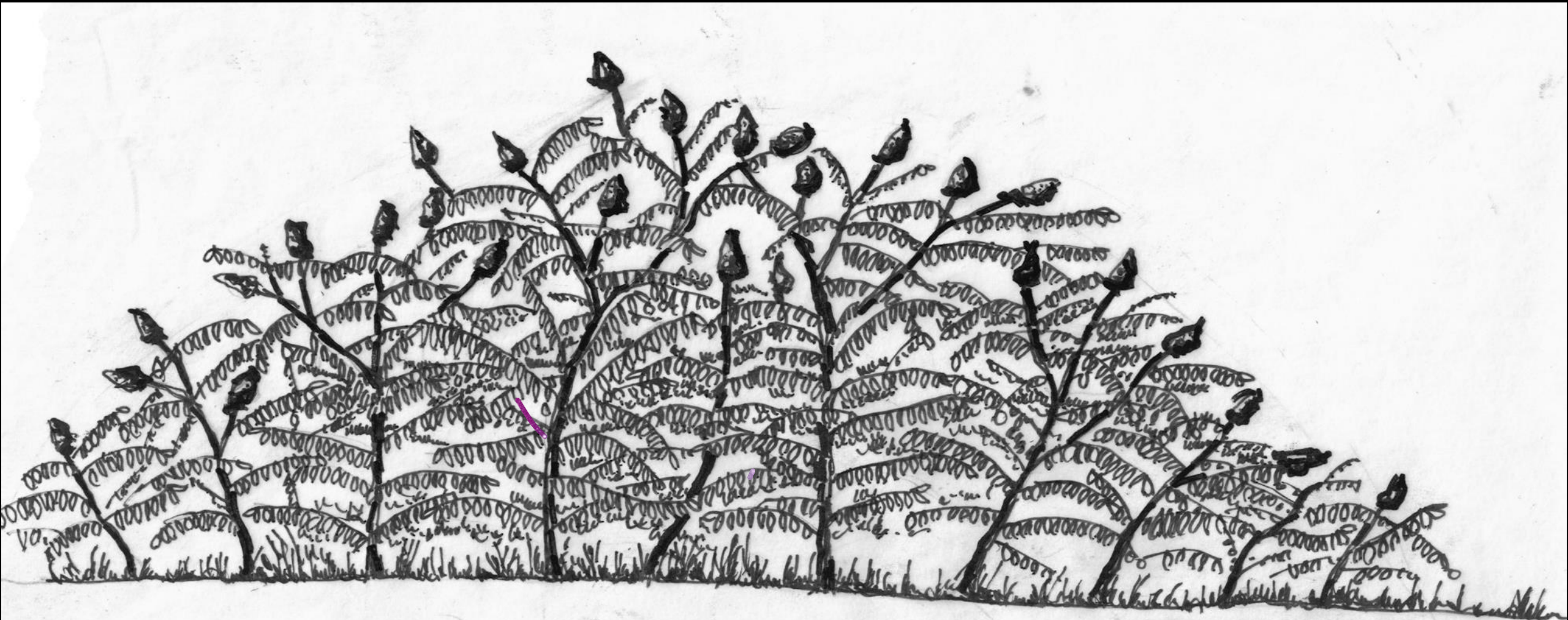
- Clones start in open fields
- Spread via rhizomes



Staghorn Sumac "Dome"

Rhus typhina

- Mature plants spread horizontally – form "dome"
- Takes over, or becomes leggy

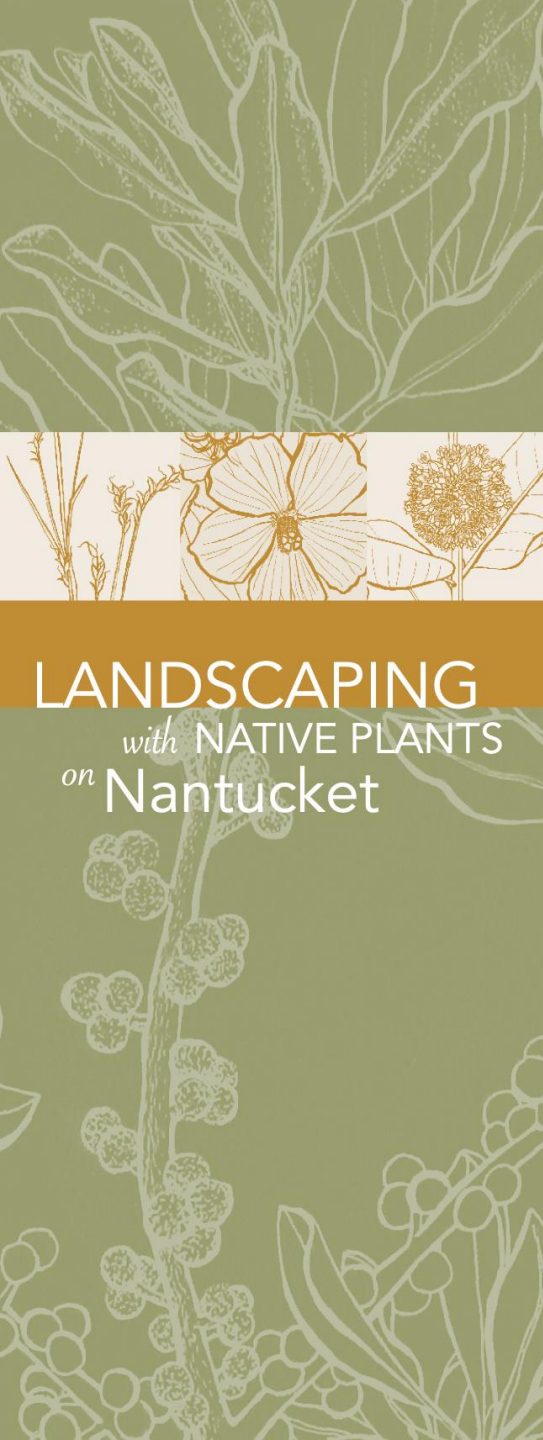


DESIGN WITH NATURE



on Cape Cod and the Islands

Jack Ahern



LANDSCAPING with NATIVE PLANTS on Nantucket

SHRUBS & VINES

COMMON NAME	SCIENTIFIC NAME	Light			Water			Best Uses					
		F	P	S	D	M	W	D	E	H	P	W	
Azalea, Swamp	<i>Rhododendron viscosum</i>	.	.		.	.	.	.	.	.	.	.	.
Bayberry	<i>Morella carolinensis</i>	.	.		.	.	.	.	.	.	.	.	.
Beach Plum	<i>Prunus maritima</i>	.	.		.	.	.	.	.	.	.	.	.
Bearberry	<i>Arctostaphylos uva-ursi</i>	.	.		.	.	.	.	.	.	.	.	.
Blueberry, Highbush	<i>Vaccinium corymbosum</i>	.	.		.	.	.	.	.	.	.	.	.
Blueberry, Lowbush	<i>Vaccinium angustifolium</i>	.	.		.	.	.	.	.	.	.	.	.
Bower, Virgin's	<i>Clematis virginiana</i>	.	.		.	.	.	.	.	.	.	.	.
Buttonbush	<i>Cephalanthus occidentalis</i>	.	.		.	.	.	.	.	.	.	.	.
Chokeberry, Black	<i>Aronia melanocarpa</i>	.	.		.	.	.	.	.	.	.	.	.
Creeper, Virginia	<i>Parthenocissus quinquefolia</i>	.	.	.	.	.	.	.	.	.	.	.	.
Elderberry, Black	<i>Sambucus nigra</i>	.	.		.	.	.	.	.	.	.	.	.
Grape, Fox	<i>Vitis labrusca</i>	.	.		.	.	.	.	.	.	.	.	.
Groundsel	<i>Baccharis halimifolia</i>	.	.		.	.	.	.	.	.	.	.	.
Hazelnut, American	<i>Corylus americana</i>	.	.		.	.	.	.	.	.	.	.	.
Hazelnut, Beaked	<i>Corylus cornuta</i>	.	.	.	.	.	.	.	.	.	.	.	.
Heather, Golden False	<i>Hudsonia ericoides</i>	.	.		.	.	.	.	.	.	.	.	.
Holly, American	<i>Ilex opaca</i>	.	.		.	.	.	.	.	.	.	.	.
Holly, Winterberry	<i>Ilex verticillata</i>	.	.		.	.	.	.	.	.	.	.	.
Huckleberry, Black	<i>Gaylussacia baccata</i>	.	.		.	.	.	.	.	.	.	.	.
Huckleberry, Blue Dangle	<i>Gaylussacia frondosa</i>	.	.	.	.	.	.	.	.	.	.	.	.
Inkberry	<i>Ilex glabra</i>	.	.		.	.	.	.	.	.	.	.	.
Laurel, Sheep	<i>Kalmia angustifolia</i>	.	.		.	.	.	.	.	.	.	.	.
Marsh-elder, Maritime	<i>Iva frutescens</i>	.	.		.	.	.	.	.	.	.	.	.
Oak, Dwarf Chinquapin	<i>Quercus prinoides</i>	.	.		.	.	.	.	.	.	.	.	.
Oak, Scrub	<i>Quercus ilicifolia</i>	.	.		.	.	.	.	.	.	.	.	.
Pepperbush, Sweet	<i>Clethra alnifolia</i>	.	.		.	.	.	.	.	.	.	.	.
Rose, Carolina	<i>Rosa carolina</i>	.	.		.	.	.	.	.	.	.	.	.
Rose, Virginia	<i>Rosa virginiana</i>	.	.		.	.	.	.	.	.	.	.	.
Shadbush, Downy	<i>Amelanchier arborea</i>	.	.		.	.	.	.	.	.	.	.	.
Shadbush, Eastern	<i>Amelanchier canadensis</i>	.	.		.	.	.	.	.	.	.	.	.
Sumac, Smooth	<i>Rhus glabra</i>	.	.		.	.	.	.	.	.	.	.	.
Sumac, Winged	<i>Rhus copallinum</i>	.	.		.	.	.	.	.	.	.	.	.
Sweetfern	<i>Comptonia peregrina</i>	.	.		.	.	.	.	.	.	.	.	.
Viburnum, Arrowwood	<i>Viburnum dentatum</i>	.	.		.	.	.	.	.	.	.	.	.
Willow, Pussy	<i>Salix discolor</i>	.	.		.	.	.	.	.	.	.	.	.
Wintergreen	<i>Gaultheria procumbens</i>	.	.		.	.	.	.	.	.	.	.	.

TREES

COMMON NAME	SCIENTIFIC NAME	Light			Water			Best Uses					
		F	P	S	D	M	W	D	E	H	S	W	
Cedar, Red	<i>Juniperus virginiana</i>	.	.		.	.	.	.	.	.	.	.	.
Cherry, Black	<i>Prunus serotina</i>	.	.		.	.	.	.	.	.	.	.	.
Elm, American (cultivar)	<i>Ulmus americana cultivar</i>	.	.		.	.	.	.	.	.	.	.	.
Hickory, Mockernut	<i>Carya tomentosa</i>	.	.		.	.	.	.	.	.	.	.	.
Maple, Red	<i>Acer rubrum</i>	.	.		.	.	.	.	.	.	.	.	.
Oak, White	<i>Quercus alba</i>	.	.		.	.	.	.	.	.	.	.	.
Oak, Black	<i>Quercus velutina</i>	.	.		.	.	.	.	.	.	.	.	.
Pine, Pitch	<i>Pinus rigida</i>	.	.		.	.	.	.	.	.	.	.	.
Sassafras	<i>Sassafras albidum</i>	.	.		.	.	.	.	.	.	.	.	.
Tupelo (Black Gum)	<i>Nyssa sylvatica</i>	.	.		.	.	.	.	.	.	.	.	.

FLOWERING PERENNIALS

COMMON NAME	SCIENTIFIC NAME	Light			Water			Best Uses					
		F	P	S	D	M	W	B	D	N	H	W	
Aster, Bushy	<i>Symphotrichum dumosum</i>	.	.		.	.	.	.	.	.	.	.	.
Aster, Sickle-leaved Golden	<i>Pityopsis falcata</i>	.	.		.	.	.	.	.	.	.	.	.
Aster, Heath	<i>Symphotrichum ericoides</i>	.	.		.	.	.	.	.	.	.	.	.
Aster, Stiff	<i>Ionactis linariifolia</i>	.	.		.	.	.	.	.	.	.	.	.
Aster, Toothed White-Top	<i>Sericocarpus asteroides</i>	.	.		.	.	.	.	.	.	.	.	.

FLOWERING PERENNIALS CONTINUED

COMMON NAME	SCIENTIFIC NAME	Light			Water			Best Uses					
		F	P	S	D	M	W	B	D	N	H	W	
Boneset	<i>Eupatorium perfoliatum</i>	.	.		.	.	.	.	.	.	.	.	.
Boneset, Hyssop-Leaved	<i>Eupatorium hyssopifolium</i>	.	.		.	.	.	.	.	.	.	.	.
Everlasting, Pearly	<i>Anaphalis margaritacea</i>	.	.		.	.	.	.	.	.	.	.	.
Geranium, Cranesbill	<i>Geranium maculatum</i>	.	.		.	.	.	.	.	.	.	.	.
Goat's Rue	<i>Tephrosia virginiana</i>	.	.		.	.	.	.	.	.	.	.	.
Goldenrod, Grass-Leaved	<i>Euthamia graminifolia</i>	.	.		.	.	.	.	.	.	.	.	.
Goldenrod, Seaside	<i>Solidago sempervirens</i>	.	.		.	.	.	.	.	.	.	.	.
Goldenrod, Sweet	<i>Solidago odora</i>	.	.		.	.	.	.	.	.	.	.	.
Indigo, Yellow Wild	<i>Baptisia tinctoria</i>	.	.		.	.	.	.	.	.	.	.	.
Iris, Blue Flag	<i>Iris versicolor, I. prismatica</i>	.	.		.	.	.	.	.	.	.	.	.
Joe-pye Weed, Coastal	<i>Eutrochium dubium</i>	.	.		.	.	.	.	.	.	.	.	.
Lily, Turk's Cap	<i>Lilium superbum</i>	.	.		.	.	.	.	.	.	.	.	.
Lily, Wood	<i>Lilium philadelphicum</i>	.	.		.	.	.	.	.	.	.	.	.
Mallow, Swamp Rose	<i>Hibiscus moscheutos</i>	.	.		.	.	.	.	.	.	.	.	.
Milkweed, Common	<i>Asclepias syriaca</i>	.	.		.	.	.	.	.	.	.	.	.
Milkweed, Orange	<i>Asclepias tuberosa</i>	.	.		.	.	.	.	.	.	.	.	.
Milkweed, Purple Swamp	<i>Asclepias incarnata</i>	.	.		.	.	.	.	.	.	.	.	.
Mint, Clustered Mountain	<i>Pycnanthemum muticum</i>	.	.		.	.	.	.	.	.	.	.	.
Primrose, Evening	<i>Oenothera biennis</i>	.	.		.	.	.	.	.	.	.	.	.
Rabbit-tobacco	<i>Pseudognaphalium obtusifolium</i>	.	.		.	.	.	.	.	.	.	.	.
Sunflower, Woodland	<i>Helianthus divaricatus</i>	.	.		.	.	.	.	.	.	.	.	.
Loosestrife, Yellow	<i>Lysimachia quadrifolia</i>	.	.		.	.	.	.	.	.	.	.	.

GRASSES, SEDGES & RUSHES

COMMON NAME	SCIENTIFIC NAME	Light			Water			Best Uses					
		F	P	S	D	M	W	D	H	L	N	W	
Beach Grass, American	<i>Ammophila breviligulata</i>	.	.		.	.	.	.	.	.	.	.	.
Bentgrass, Autumn	<i>Agrostis perennans</i>	.	.		.	.	.	.	.	.	.	.	.
Bentgrass, Rough	<i>Agrostis scabra</i>	.	.		.	.	.	.	.	.	.	.	.
Bentgrass, Winter	<i>Agrostis hyemalis</i>	.	.		.	.	.	.	.	.	.	.	.
Bluestem, Big	<i>Andropogon gerardii</i>	.	.		.	.	.	.	.	.	.	.	.
Bluestem, Bushy	<i>Andropogon glomeratus</i>	.	.		.	.	.	.	.	.	.	.	.
Bluestem, Little	<i>Schizachyrium scoparium</i>	.	.		.	.	.	.	.	.	.	.	.
Cordgrass, Prairie	<i>Spartina pectinata</i>	.	.		.	.	.	.	.	.	.	.	.
Cordgrass, Saltmeadow	<i>Spartina patens</i>	.	.		.	.	.	.	.	.	.	.	.
Cordgrass, Smooth	<i>Spartina alterniflora</i>	.	.		.	.	.	.	.	.	.	.	.
Grass, Poverty-oats	<i>Danthonia spicata</i>	.	.		.	.	.	.	.	.	.	.	.
Hairgrass, Wavy	<i>Deschampsia flexuosa</i>	.	.		.	.	.	.	.	.	.	.	.
Indiangrass	<i>Sorghastrum nutans</i>	.	.		.	.	.	.	.	.	.	.	.
Lovegrass, Purple	<i>Eragrostis spectabilis</i>	.	.		.	.	.	.	.	.	.	.	.
Rush, Soft	<i>Juncus effusus</i>	.	.		.	.	.	.	.	.	.	.	.
Sedge, Pennsylvania	<i>Carex pensylvanica</i>	.	.		.	.	.	.	.	.	.	.	.
Switchgrass	<i>Panicum virgatum</i>	.	.		.	.	.	.	.	.	.	.	.
Wildrye, Common	<i>Elymus virginicus</i>	.	.		.	.	.	.	.	.	.	.	.

FERNS

COMMON NAME	SCIENTIFIC NAME	Light			Water			Best Uses					
		F	P	S	D	M	W	D	H	L	N	W	
Fern, Cinnamon	<i>Osmundastrum cinnamomeum</i>	.	.		.	.	.	.	.	.	.	.	.
Fern, Marsh	<i>Thelypteris palustris</i>	.	.		.	.	.	.	.	.	.	.	.
Fern, Massachusetts	<i>Parathypteris simulata</i>	.	.		.	.	.	.	.	.	.	.	.
Fern, New York	<i>Parathypteris noveboracensis</i>	.	.		.	.	.	.	.	.	.	.	.
Fern, Royal	<i>Osmunda regalis</i>	.	.		.	.	.	.	.	.	.	.	.

SITE CONDITION CODES

Sun Exposure **Soil Moisture** **Best Use Codes** **H**=Habitat/Restoration **P**=Privacy Hedge/Screening
F=Full Sun **D**=Dry **B**=Bee/Butterfly Garden **L**=Lawns/Groundcover **S**=Shade Tree
P=Partial Sun **M**=Moderate **N**=Deer Resistant **N**=Naturalizing/Wildflower Meadow **W**=Wind/Salt spray Tolerant
S=Shade **W**=Wet ***E**=Edible Value

Examples of Resilient Landscapes on the Cape and Islands

- Beach House
- Edgartown Great Pond Residence
- International Fund for Animal Welfare
- Mytoi Gardens
- Nantucket Residence



Beach House, Cape Cod Bay, Studio 2112



Edgartown Great Pond Residence, The Nature Conservancy



International Fund for Animal Welfare, Yarmouth, Stimson, DesignLab



Mytoi Gardens, Chappaquiddick Island, Julie Messervy





Nantucket residence, Jardins International, Elisabeth O'Rourke

Conclusions

- Issues with Conventional Landscape Design
- Benefits of Resilient Landscape Design
- Native and Designed Plant Communities

And a few recommendations.....

- Build on Nantucket's conservation ethic/leadership
 - Promote/recognize resilient landscape design (awards, garden tours, talks, K-12 education,)
 - Consider assisted migration for climate-adapted plant species
 - “get on the map” Homegrown National Park – <https://homegrownnationalpark.org/>
 - Develop native plant nurseries on Nantucket's protected lands?
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- Questions/Comments ?
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- Thank You! Jack Ahern jfa@umass.edu