The GRADUATE SCHOOL of ARTS AND SCIENCES HARVARD UNIVERSITY

Wood, Annie. M. 1931 Noman's Land. Isle of Romance. Reynolds Printing
New Bedford, MA

Married Cameron Wood - Barr MA

→ Indian Legend Noman's + Squibnocket connected by sandbar
Technically - part of Chilmark
Called Martha's Vineyard by Gosnold ; Hendrik Christiansen's Eylant - 1616
Ile de Hendrick 1646 (was w/ A Block) ; 1675 - Dock Is
1666 - NY - called Noman's ; Isle of Man
Poss. from Tequenomans - Indian chief MV
More temperate than MV
Swamps Dammed - (unclear if native ponds)
Large peat beds w/ cedar, pinecones
Was Virgin forest
Leif Eriksson stone MI
Gosnold - Concord + Dartmouth 1602 - off S shore MV
Nomans - huge trees - beech + cedar
Later. E Bard Pt - had shell heaps near - may have been connected
Scalping - not practiced until 1637 - induced by Pilgrims

Moshup Legends - Thos Cooper learned from his grandmother who was a
"stout girl - 1642" Thos Cooper - born 1725 - told Benj.
Bassett - Chilmark

Pasture for ~650 sheep ; mild winters ; sheep herd 1-1¼ sheep/ac
Oxen
Cattle 8x sheep Cow - 6x

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Over

Fisherman - haul boats up on shore each night - no ~~___~~ harbor
up to 40 fisherman famil[illegible]
v. rich farmland - moraine

Joshua Crane - Boston - owned ~1915
Ralph W Wood in charge

MV - has wonderful forests of huge trees

British 1778 - Charles Grey
10,5?? sheep 315 cattle 52 tons hay
all swine + poultry

Quicks Hole - between Pasque / Naushon

1915 - erected breakwater

Menemsha Creek - was Weiwatick River - out of tidal pool (pools?)
Menemsha Cr.

MV Conservation

New Phytol. 140: Bowman

Aborigines - can't unequivocally link Aborigines to fire, extinctions, was critical for habitats lost w/ Eur. 18th + 19th C accounts uncertainty + disputed predictive knowledge unknown - intentionality vs systematic + purposeful

Jones 1969 - conserve enviro as 1788 or 30K BP; DB - need to conserve extant biodiversity

Ecos Rest Okada 1999

Japan - mutually beneficial relationship culture + nature

coppice in rural Japan ↑ biodiversity unintentionally ; fuelwood

20-30 yr - overstory, understory, cut recreation, aesthetic value

Historical approaches forgotten + lost ; new invasives ; cost

Pykala 2000

Grazing, mowing. (similarity natural disturbance + animal husbandry - human-made habitats ; semi-natural grasslands

Perpetuate natural process - megaherbivores, fire, flood; mitigate eutrophication

Abandonment + Intensification

Most landscape used ; cattle forest graze; irrigation, manure, nutrient shift from forests + grasslands → tilled area (Past)

2000 Balmer + Erhardt

Old fallow land critical ; butterfly fauna - more distinct + diverse

Need rotational mgt

Vera

Park-like primeval veg - thorny stands of scrubs → forest → grassland (theory of cyclical vegetation turnover)

Bradshaw + Mitchell

Use paleo to reconstruct grazing-veg interactions

Giant deer - converted juniper scrub to grassld

Kirby

Q: should coppice be re-established - Steele + Peterken coppiced 147,000 ha now up to ~45,000; but each wood - unique history; need to study context; deer impacts Need LT monitoring

Dore 2004 | Importance tropical grasslands; historically used early; bias towards forest

2003
Tim Simmons | Letter on Bruce Hammond memo

Grasshopper Sparrow - Popns declined + failed w/ cessation of Ag on MV, ACK, EI; meso-predators - cats, skunk, coon, otter

TNC 2003 | Gs back at Katama - 6 ♂

Kirby | English Nature project to maintain/create wood pasture, parkland etc. - but with eye to Vera   Evaluate history; then manage w/ large grazing animals "new wildlands"   Free-range grazing system

Fuller 1987 | Major Eur focus - ag + wildlife conservation

Worry - agricultural improvement

1871 6.0 m ha arable land much to grass 1880 - 1.5 m ha.

Pre-war 5.2 m ha unimproved lowland pasture → 3.1 m ha post-war

Plowing + improving, ↑ weeds, ↑ N → 0.6 m ha 1980 (unimpro, semi-natural)

85% grasslands fertilized

2001
Chamberlain Fuller | Modern grassland - suboptimal;

Grassland changes; ↑ fertilizer, ↑ mowing; improved from rough; ↑ # sheep;

2000
Chamberlain et al. | Intensification; shift hay to silage; ↑ fert; ↓ hedgerows, ponds + other non-crop habitats; ↑ specialization, ↓ diversity of Ag, new crops, ↑ machines

Time lags

Fuller + Gough 1999	↑ sheep #s 1970s → 80s
McCallum	Decline old field, shrub, young second growth - focus woodcock
Coastal Grassland	Maritime plant communities... particularly grassland, heathland and shrubland
	...are revitalized by fire... The Sandplains evolved and are maintained
	with fire...
	Savannah sparrow - abundant on ACK grasslands; upland sandpiper,
	grasshopper sparrow, bobolink - v. area sensitive
	Towee - precipitous Northeast decline - one of fastest declin.
Dunwiddie + Sferra 1991	Regal fritillary - Most E pop'ns - pastures, hayfields, wet meadows - NE extirpd
	except ACK, BI, Naush, MV - severe ↓ also Agalinis (extinct on MV)
	cessation grazing - short veg structure, hoofprints, warm microenviro:
Morelle 2010	↓ GB hay meadows ↓ diversity w/ > intensity
Raleigh et al.	Sand Barrens Habitat Mgt - Toolbox, Indians - burning/girdling;
	Eur adopted burn/girdle; ↑↓ traditional LU - burn, clear, mow, graze
	Grazing - benefits - target veg, flexible seasonality + frequency; mow; fire
	Prescribed Grazing - Wide behaviors; UK Grazing Animal Project (GAP)
	cost, difficult, may severely alter veg; ↑ aesthetic, expose mineral soil,
	graze + rest
Askins 2007	Mow, graze, burn; Meadowlark, bobolink, Grasshopper sparrow, Henslow's
	Sparrow, Upland Sandpiper, Common Yellowthroat, Bobwhite, Kingbird
	Bison grazing ↑ Ghopper, Meadowlark
	Pay farmers, incentives, farm product with self-help $
Hammond 2000	190 a Katama Plain Cons Area - TNC purchased 123 ac 1985 - sold to town
	CR to TNC; Town then purchased 2 other tracts 68 ac
	162 ac Katama Town Farm to E; current lease - Merv Hardwick - 100 cows
	+ 180 ac hay, 30 ac plowed; 61 ac Herring Creek Farm - leased to
	Merv - hay; to S 29 ac "North Triangle" DFW owns 18 ac N +
	DEM owns S.

K?CA - 1st area in NE managed w/ fire

1889
K. Scott MAS — Katama - long-standing grasslands

Elisha Smith →(1964) Alvin Strock (dentist; owned 1800 ac.) filed for bankruptcy -

Bob Woodruff → Edg Cons Comm w/ VCS (sold homesites on 30 ac. VOLF) →

Stephen Potter proposal for dairy - Seaside Dairy (shut 1986) → James McCarthy

2001
Maron + Jeffries — Spp rich grasslands ↓ w/ N but ↑ biomass + invasion; mow + biomass removal

native grassland - low soil N; ↑ spp diversity ↓ exotic grasses ↓ aboveground

biomass ↑ belowground; ↑ N retention ↓ leaching; but N retention in soil - high

RINHews 1997 — Extensive prairie - LI, MV, coastal CT + RI. Heath Hen dependent on prairie - due to

fire suppression - now state forest

Mow then harrow, plow (buries weeds), plant   USFWS

control Huckleberry, Myrica, Q ilic

Dunwiddie 1998 — Needed multiple burns; more effective than mowing

TNC - EcolSystems ~ All evidence of presettl veg obscured w/ 17th C land clearance + sheep

David Foster
Director
Harvard Forest, Harvard University
(iPhone)

Brian
AW within Forest
within natural

Begin forwarded message:

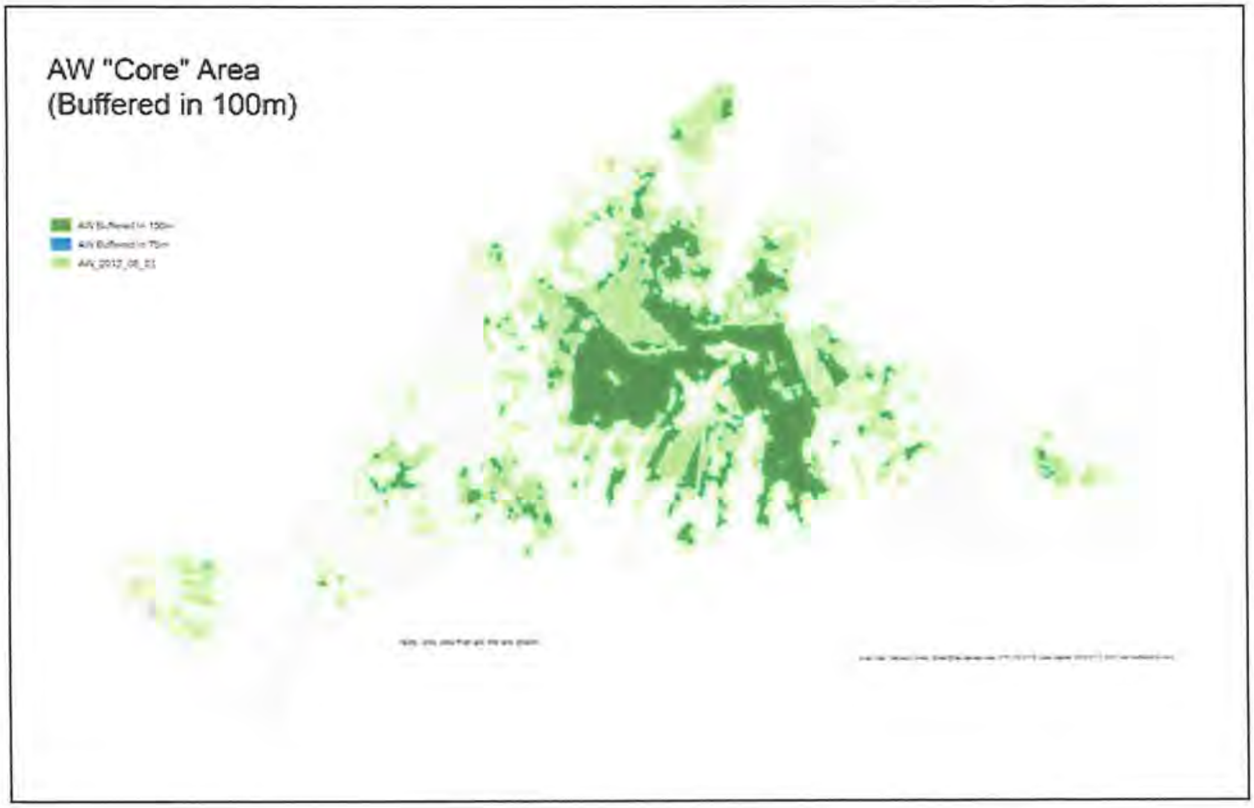
From: "Hall, Brian" <brhall@fas.harvard.edu>
Date: August 28, 2012 1:16:20 PM EDT
To: "Foster, David" <drfoster@fas.harvard.edu>
Subject: AW Edge

David,
Here are the edge density stats that we discussed to generate ideas as to when AW is fragmented to a point where it is no longer "intact" AW. I like the second idea that I came up with using interior buffers (or "cores") shown at the bottom. We can discuss when you are back at HF-I put printouts in your office.

8/28/2012 Tuesday

Rerun model using 100m cell.

[X] any rules of thumb in Forman Land Mosaics? No. But I got to thinking about what characteristic or feature of AW are we trying to define as being degraded in perforated or fragmented areas. In general we are talking about how the woodland looks to a human being standing in it in essence, the human hiker becomes the "species of concern". We are not talking in terms of the continuous, homogeneous understory layer (understory composition and invasive or edge species as is often done in "edge" studies) since that understory usually continues right up to an edge (at least with roads, but maybe less so in landscaped yards or near edge-species filled old fields). Instead, I believe we are talking about the landcover types (development, obvious secondary woods, etc) that are visible from within the AW woodland. So I decided to simply buffer the AW in by the distance that a person could see (such that if he was inside the AW polygon by a distance greater than that buffer, he would not see a house and its yard). So I ran interior buffers of 75m and 100m. I like this concept better than the edge density since it makes more intuitive sense and is based on some "hard" numbers and rationale.



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M V

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 in-tact 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.