

Harvard Forest

Grazing and Conservation: A Working Landscape Seminar September 6-8, 2016

Introduction - David Foster

- Conference focuses on intersection between agriculture and conservation, with a further focus on grass-based agriculture.
- Exploring opportunities to meet conservation goals by agricultural management, at lower costs than mechanical/fire regimes. Can generate local resources in the process.
- Use framework of the Wildlands & Woodlands visions and New England Food Vision – increase land protection in New England, but much of it to be managed for a range of benefits including food, wood, and ecosystem services

New England Farm History + Future, New England Food Vision – Brian Donahue

- 75-90% clearing of land in 1800s in New England – farmland peaks with commercial pastoral boom in sheep, butter and cheese
- “Decline” of NE farming in late 19th century. Cheap western grain and difficulty controlling pine in marginal pastures led to rapid shrinking of farmland in use, but not to a decline in production. Grain replaced pastures in feeding cows and increased flow of milk.
- Farmland contracted, but production peaked in early 20th century with milk, vegetables, fruit and hay for cities. “Concentrated products” that could not be easily imported until later in the 20th C, whereupon NE farmland declined to present level of 2 million acres or 5% of land
- New England Food Vision focus is – “How much food could NE produce, and should we produce that much?” What values would be served? Food justice, healthier eating, more sustainable farming if we use appropriate crops and methods.
- Estimates are -> can produce half of our food including most vegetables and fruits, along with dairy and beef/lamb in a grass-based system of 6 million farmed acres, or 15% of NE—similar to 1945.
- Would require clearing of 20th C pastures that are currently white pine, as well as leveling the playing field between industrial farms and small farms.
- Need to consider water quality and carbon sequestration when clearing forests for farmland—would this be a net gain over present conventional system? Can grass-based farming support increase in habitat for open land species?

Grazing in New England: Commerce and Demand – Ridge Shin

- Early 1800s – everyone produced on farms -> traded at stores for things they couldn't make -> store sent produce to cities. Closed, sustainable system.
- Grass-fed beef market is massive and growing, but most in US currently comes from Australia. Opportunities for a domestic market.
- Cattle in New England are currently shipped west to finish on factory farms—150,000 calves a year. Good opportunity to keep the money, jobs and food here, as well as the benefits of grazing cattle on landscape. Key is how to finish them. Need

access to land in large pieces so it can be efficiently managed to get high-quality product. Advantage is cattle don't need to be on these finishing grounds year round.

- Currently, best soils are used for growing corn for livestock industry in US, and corn growth is not good for land. Rotational grazing builds soil, stores carbon + water, and revives economy.

Discussion:

- Petersham Conservation Commission comments on benefits of reducing transportation through local agriculture. Less importation reduces carbon footprint.
- Smaller ruminants like sheep are more vulnerable to parasites and predators, so cattle are easier to protect
- Lots of "grass-fed beef" in market is still finished on grain, which is damaging for soil
- Can grain be grown sustainably? Yes, but more difficult to keep sustainable than grass-fed beef. Not enough acreage available in NE to make significant impact on grain production.

Growing Deep Soil Watersheds – Abe Collins

- How to build deep topsoil watersheds with agriculture? Livestock grazing.
- Deep topsoil helps protect land against natural disasters (faster water absorption and more retention) while increasing health of crops.
- There are two competing ideas in soil conservation – soil is non-renewable, so conserve what is left vs. soil is a renewable resource: we can grow new topsoil
- Best way to grow topsoil rapidly is to graze properly, leaving plenty of litter on the surface, increasing depths of roots
- Sometimes scientific research creates bottlenecks to innovation by saying what the best management techniques are across all farmlands – situation can vary from farm to farm, and farmers should innovate to find what works best for them
- Necessary to build monitoring systems for landscape using math models, SIS (soil information systems), Skyview (looking at past watersheds, observe how landscape has changed), stream monitoring and Farmer Network
- Payments to farmers for ecosystem services provided by careful topsoil management should be implemented—pay for output, not prescribed practices

Discussion:

- Can government set up this soil monitoring system? Government often bottlenecks innovation, so open platforms (similar to AirBnB, Uber) can make change happen faster. Need bottom-up change, not trickle down.

Grass-based Dairy at Chase Hill Farm – Mark Fellows

- Inherited farm from family and moved it back to grass-based agriculture. Raise cows on grazing and small amounts of grain
- Switched to seasonal dairying, started making cheese in 2001

- Seasonal dairy-making gives grass and cows long rests, and has had positive impacts on landscape. Has also allowed bobolinks and other wildlife to thrive.
- Invasives remain a challenge—rose, bittersweet. Cattle carry out some amount of invasive species control.

Discussion:

- How to encourage late nesting birds? Mark has seen bobolinks nesting in rotationally grazed pasture. Perhaps cutting hay late isn't the only way to do it.
- Are there opportunities for non-farmers who own grassland to work with farmers and allow grazing on their properties? Sometimes. But often hard to coordinate, because fields need to be close to the farm for it to be worth the time moving stock, and some landowners can be fickle about use of the fields
- Fragmentation of a good grazing block makes it expensive to move animals – farmlands need to be aggregated

Restoring Soil Health and Ranch Livelihoods – Richard Teague, Texas A&M

- Not enough for farming to be sustainable -> must first restore degraded ecosystems
- Limiting factor in rangeland farming is water in the soil
- Multi-paddock grazing allows best recovery of plants and soil, as well as best water infiltration
- Managers can control how long a paddock is grazed, and how long it is allowed to recover before the next grazing cycle
- MP grazing also improves wildlife habitat, takes more carbon into the soil per year than continuous grazing, and allows for more variation in plants than conserved, non-grazed lands where certain plants quickly become dominant
- Agriculture could switch from being a carbon source to sink if carried out properly

Discussion:

- If RMP is so beneficial, why isn't it the norm? Agricultural research and farming practice change slowly—a lot of inertia. Also, some personalities involved in promoting grazing have been off-putting.
- Research done in agriculture in one region can't be applied to 100% of the country. Need to measure effects in situ and consider needs of each region
- Agricultural pricing doesn't account for externalities – farmers need to be paid for ecosystem services

New England Soil Carbon Issues and Studies – Alix Contosta, UNH

- Need to consider what is being replaced by grass-based systems. Replacing high disturbance cornfield with pasture increases carbon storage, while replacing forests with pasture not so good in terms of carbon management
- Forests store more above ground carbon than all other systems, but grassland systems have almost the same amount in the soil as forests

- Hidden costs and GHG emissions in grass-based farming when compared to different land types. It isn't just about the pool of soil carbon—it's about fluxes, and other ghg's such as N₂O. Highly complicated.
- Intensive rotational grazing increases carbon and nitrogen in soil, but with higher GHG emissions. Does increase in GHG losses cancel the carbon storage benefits of grass fed beef? Could be a challenge, need to quantify change in carbon over time
- Current ongoing research UNH is carrying out with different types of pasture management and with silvopasture – could retain some benefits of forest while also allowing some grazing
- Another current UNH study compares intensive rotational grazing with haying in terms of carbon management

Discussion:

- No-till farming can build soil carbon and reduce erosion, but could have hidden costs depending on how it is implemented
- How is lumber harvested in silvopasture? Acre-sized parcels with hardwood sold as lumber and pine turned into woodchips
- When harvesting trees in silvopasture, do replacement trees need to be planted? Is this a sustainable forest model? Very site specific—would depend on the goals of long-term management. Are you moving the parcel gradually toward full pasture, or planning to let it revert to forest, or intending to hold it in partially open condition?
- Worth noting that when a pasture is cleared from forest in New England it may be also in effect replacing a cornfield in the Midwest at the same time.

Soil and Water Quality Challenges, Best Management – Betsy Colburn, HF

- Potential problems and opportunities with water quality as we increase pastures and livestock in NE
- Data shows that even rotational grazing can have nutrient run-off, erosion and other environmental effects if not managed carefully
- Major NE water quality issues: coastal nitrogen inputs leading to salt marsh decline, nitrogen infiltration into groundwater causing drinking water contamination, surface eutrophication, phosphorus input into inland water causing eutrophication
- If NE Food Vision goals of expanding pasture and livestock are realized, could be much higher discharges of nitrogen into the watersheds. Need to prepare for mitigation of these inputs before they occur
- How can we provide financial reimbursement to farmers so that they can help evaluate and improve best management practices?
- Farmers need to help shape policies that control runoff and other pollution from agricultural production
- Restrictions need to be incorporated into conservation easements as well

Grassland Management and Biodiversity – Conrad Vispo, Farmscape Ecology Program, NY

- What are the trade-offs of maintaining a field for production or for biodiversity?
- All fields look very different and need to be managed differently
- On many fields as soil declines, native species increase – poor meadows still support lots of native butterflies
- Often a trade-off between agricultural productivity and biodiversity—need to work out how to incorporate those places into an entire farm or landscape.

Economics of Grass-based Livestock Farms in NE – Sarah Flack, VT

- Pasture and herd-size is not always the weak link in grass-farming when a farm is struggling. Need to look honestly at full picture to draw up good business plan
- Farmers need to stop looking at current market prices, and instead look at cost of production per unit of food produced in order to determine accurate prices for product. If they can't figure a market where they can get an adequate price, won't have a viable business plan no matter how well they manage
- Would be great if farmers could be paid for the ecosystem services they provide, but that isn't happening yet. Means farmers are often competing against others who succeed by externalizing costs.
- Maximizing cattle forage intake and lengthening the grazing season decreases costs, as the farmer needs to buy less feed and grain
- Grass fed dairy farms need increased land to make up for the lack of grain in cow diets. Many farmers would like to switch to organic dairy because milk prices are higher and have remained steady, but this is often precisely because milk buyers have been slow to take on more suppliers
- start-up costs are high—takes 5-7 years to build up beef herd to getting steady return. Dairy gives quicker return, but start-up capital costs are very high
- Priority in NE farming: prevent continued fragmentation of farmland by development because it decreases the usefulness of those farms -> not viable for moving stock across now distant fields

Discussion:

- Farmers can realize a great saving if they sell their heavy harvest machinery and go into grazing. Yes, but problem is many of these machines have loans on them—not so easy to make transition
- Vermont has an organic farm dairy transition program, but still need to find more milk buyers—not being fully utilized

Restoring Soil Carbon on Farms – Richard Teague, Texas A&M

- More fungi present in multi-paddock grazing – healthier for crops
- Adaptive Multi-Paddock grazing leaves large amounts of substrate for soil organisms to feed on, increases percent of organic matter in soil
- Cover crops can also improve soil health in tillage farming

Soil Carbon – Serita Fry, UNH

- Globally, soil contains twice as much carbon as that in vegetation and the atmosphere combined. When we manage carbon, soil can act as a source or sink
- Potential to recover soil carbon yearly through better land management
- With land management we can mitigate some of excess CO₂ being released, but cannot solve the problem through agriculture alone—soil capacity isn't great enough
- New England soils have less carbon to lose and less to store -> coarse texture, thin soils
- 40-60% of original soil carbon has been lost, mainly in the Great Plains and corn belt
- Practices that maximize soil carbon and forage may also stimulate gas emissions like nitrogen

Discussion:

- Can we build better New England soils through agriculture? Yes, but ultimately potential of NE soils to store carbon is not equal to Southern/Plains soils because of the basic make up of these soils
- What about biochar? Biochar largely doesn't add to soil carbon directly because it doesn't break down, but can have an effect of other soil processes. More research needed.
- How can we change the structure and manage to get the best out of fungi? Manage the soil for organic matter and fungi will come. Need to minimize disturbance so structure can build
- No such thing as "good" soil structure – all depends on what your goal is for the land
- Soil tests are readily available from Penn State and Cornell
- Soil carbon is a large pool that does not turn over rapidly – that makes it hard to detect meaningful change in the short term. If trying to improve soil carbon quantity, like at Harvard Farm, must monitor over many years to see differences

Soil and Water – Dorn Cox, NH farmer

- Cannot rely entirely on soil tests when managing land – must look at physical evidence
- Important to mitigate nitrogen runoff from farms, as it is more expensive for wastewater plants to remove it after it gets into waterways. Lost nutrients are lost income to farmer—need to be replaced by purchased fertilizer.
- Long Island Sound Regional Conservation Partnership program – developing baseline and then assisting farmers in meeting farm standards
- Need to monitor water infiltration rates on farms, not just carbon content, to determine management needs. Farm observation/citizen science model – Farmers and others participate at the landscape and community level. Localize knowledge. Circulate information in addition to involving more people in their watershed

-Many new low-cost technologies are available for monitoring and data sharing among farms

UNH Organic Dairy Farm – John Aber, UNH

- Currently have 40-50 milkers on 100 acres of pasture, carrying out research on nutrition, productivity and silvopasture usage
- Exploring biggest challenges to organic milk providers in NE -> financial viability and environmental impacts
- Developed integrated system to provide bedding, composting, energy and CO₂ from the farm itself
- Average NE dairy farm has over 100 acres of woodlands. UNH system produces bedding from wood harvested on farm sustainably, bedding/manure composting generates heat for hot water through ventilated pipe system. Low energy input—fans can be run on solar electricity
- Composting protects water better than stockpiling manure before spreading

Discussion:

Could this work on a small farm? Trying to downsize composting system so small landowners could use it

- Do bedding chips need to be dried? Dry has less bacteria, both are fine
- If we want more animals, what do we need to do to keep water quality high? Figure out where nutrients are going – needs to be a circulatory monitoring system

Biodiversity and Grazing: Synergy? – Russ Hopping, The Trustees of Reservations

- Grasslands are declining in New England. Hence, a high number of species of concern are grass and shrubland species. Bobolinks are a good indicator species to serve as shorthand for many others. Distinctive, recognizable.
- Some species need relatively unproductive landscapes to thrive—grazing may be one way to produce those habitats.
- Can we use grazing as a conservation tool economically? Should also think about grassland productivity in terms of biodiversity
- Will certain plants increase or decrease in population with grazing? Need good models and data—examples that work to meet conservation goals.
- TTOR staggers mowing in fields to leave pollinator habitat all season long
- Will be implementing rotational grazing in these mowed fields to encourage regrowth

Discussion:

- Will climate change affect mix of warm/cool season grasses?
- Need to connect terminology across disciplines so scientists, farmers and others can speak to each other. How do those ecological goals and terminology in farming and grazing productivity goals?

Grazing and Diversity – Richard Smith, UNH

- How can we use plant and forage diversity to improve a grazing system?
- What role does plant diversity play in grazing systems, and what is most effective at increasing diversity? How is water quality/carbon sequestration affected by plant diversity?
- Plant annual forage to augment perennials during seasons of low productivity – could this enhance pollinator populations? Does it negatively impact grazing goals in the process?
- Need disturbance to get annuals established – how do you do this when other species need minimal disturbance?
- Silvopasture is something that many are interested in but little is known about its effectiveness in the US/Northeast

Discussion:

- Is a pine forest too acidic for silvopasture? You can lime it to bring acidity down, but still may not be best choice -> try to stick with hardwood forests
- Silvopasture goals -> open up pasture while creating a place for animals to have shade. What happens to carbon/nitrogen during transition? How many animals can be on an acre in silvopasture? If we want to increase local food production, deforestation is going to happen, but silvopasture may be the sustainable way to accomplish this goal
- Challenges of maintaining open grazing grasslands -> invasive plants (rotational grazing can help with this), infrastructure (electric fence, rolling water)
- Historical tension with bobolink + other grassland birds – we increased their habitat with deforestation and now grasslands are declining. Trying to provide habitat for bobolinks is partly an emotional connection to New England's lost pastoral landscape, but this is not a bad thing. Conservation is about managing for values and benefits people want, not just what is “ecologically correct” or “natural.”

Weatherlow Farms Consulting – Rebecca Brown

- Using goats for remediation and for returning a habitat to grassland from shrubland. Mob stocking can make rapid changes in vegetation and soil.
- Defoliation of unwanted plants + defecation and trampling by goats to prep soil for grassland habitat
- Clients on Martha's Vineyard (conservation organizations and private landowners) are willing to pay for this service. People like not only the change to more accessible vegetation, but also like seeing livestock out their windows.

Hawthorn Valley Farm – Steffen Schneider

- HVF is a nonprofit farm part of a larger Steiner association with a Waldorf K-12 school, farm store, and also research initiatives (Farmscape Ecology Program). HVF grazes ruminants on grasslands, integrating animal and crop production
- Larger question: what does agriculture need to look like to thrive? How to reduce current trend of people leaving rural areas/farms? Can we structure our farms to serve both the economy and nature?
- The winter manure, waste and bedding from cows is composted and applied to fields in fall -> allows the transfer of nutrients to grain and vegetable fields
- In return, cover cropping with legumes provides good dairy feed when rotated with grains
- In general, we should use the highest productivity land for direct human food, and find ways to use the lesser land for livestock rearing and foraging. Current agriculture is the opposite

Discussion:

- If farming is not attractive to people right now, how do you make room and bring new people in? Hawthorn Valley is trying to help through educational and training programs, but economics also need to be addressed
- If soil health is so important, how does everyone not feel accountable? Land ownership is private, perhaps not best way to manage this resource. But is federal/public land treated any better?

Livestock Program, Connor Young, The Trustees of Reservations

- TTOR converted their vegetable operation at Moose Hill Farm to livestock because of soil erosion
- Now run a nomadic grazing operation to raise enough cattle each year to turn a profit and protect habitat - much of Moose Hill Farm is prime bird habitat, so cannot use it through the entire season. Also lack infrastructure on-site for wintering.
- Need to put together enough land to run enough stock to make for efficient and profitable management—but then the logistics of moving between sites becomes difficult.

Discussion: Do Trustees have mechanisms for considering the bird habitat part of the “profitability” expected of the grazing operation? Trustees are now working on how to make those assessments of what they do—how to bring ecology and agriculture into the same economic equation.

Maine Farmland Trust – Amanda Beal

- How do we bring land back into agricultural production without sacrificing water quality?
- Maine must consider fisheries as well, as they’re very important to the culture, community and economics in the state
- Agriculture conservation easements are meant to protect working landscapes. MFT works on farmland protection and access, viability and public outreach
- Performs public outreach with art gallery and regular journals, plus policy work

- Links farm buyers with sellers, hopes to focus more in the future on helping enable the right kinds of land (ex – land prime for dairy farming or vegetables)
- In terms of NE Food Vision, Maine has most available land to be converted to agriculture, but need to work with those conserving forests and protecting fisheries to see how we want the landscape to change, avoid creating conflicts

Grassland Birds – Jon Atwood, Massachusetts Audubon Society

- Challenge for protecting birds on private lands. How to get farmers to delay hay harvesting until late July/early August to protect birds? How to make it profitable?
- The Bobolink Project. UCONN initially set up program where conservationists donate money to farmers so they can delay haying and harvest lower quality hay without losing money. MAS and partners have kept project going in VT and MA.

MassWildlife – John Scanlon

- Goal of MassWildlife is to conserve biological species and the places they occur. Can agriculture help protect wildlife?
- State is interested in having rotational grazing on state lands that are currently mowed or maintained by fire regimes. Can happen if it fulfills mandate and is cost-effective.
- To maintain MA habitats, MassWildlife needs to designate grasslands, shrublands, young successional forests and late successional forests. Agriculture could help with grassland and shrubland creation and maintenance.

Mount Grace Land Conservation Trust – Jamie Pottern

- Mount Grace has protected farms but is moving toward a focus on protecting food systems
- Oversees agricultural easements that ensure the land is sold to farmers and will not be otherwise developed
- What is the role of land trusts? How far can they expand their definitions? What else can a land trust do to fill the gaps in food systems?
- Greater Quabbin Food Alliance brings together those involved in food systems to have a dialogue about challenges and solutions

Franklin Land Trust – Will Anderson

- Protects land, helps get farms into the APR program
- CT River Valley has very good soil, but there's still an exodus of dairy farmers
- Some conservation easements are too narrow and do not allow for new ideas, like silvopasture or conversion of forest to pasture. Early conservation restrictions weren't thinking about changes in farming techniques, which creates barriers for innovation. Language needs to protect land base while allowing for flexibility and changes in ideas
- Need to focus on preventing grazing land fragmentation to reduce problems for farmers in the future

NRCS – Barbara Miller (formerly NRCS)

- NRCS is a national program that tries to pay farmers for ecosystem services--intrinsically hard values to define--tries to be one size fits all.
- States have some autonomy. State technical committee meets regularly with group of stakeholders to decide where this money needs to go
- People can attend and have a voice in these decisions

American Farmland Trust – Jessie Robinson

- Aft protects farmland from development, retains farmers and encourages good farming practices
- Focuses on public policy and research
- Over 1/3 of small farms in US owned and worked by people over 65+ years, often don't have younger people working with them. Need to get more young people involved as sales happen
- Research being carried out to determine if new generation has money to purchase and expertise to maintain farms
- How do we make maintenance of ecosystem services pay? Broader environmental concerns can help bring the public in on this issue and help monetize ecosystem services for farmers

Discussion:

- Is there an opportunity for ROWs to be kept open with grazing? Hard to define value of this service.
- There is a lot of money that goes into conserving farm real estate—is the protection model the best use of resources? Maybe not in long-run, but in short-term need to concentrate on farms that are vulnerable. Long-run maybe we can think about other models for owning land and supporting farmers that would allow conservation values to be more explicitly valued.
- Eligibility criteria for APR's makes it hard for many farms to qualify, and they are some of the most affordable farms for the next generation—thinking particularly of diverse, scrappy hill farms that could be managed for productive grazing and conservation values.
- Are there unintended consequences of solar farms on the landscape? Does this undermine keeping farmland open, or does it provide an extra income stream to farmers in a way that still allows some grazing use, and is ultimately reversible if necessary?
- Fusion of agriculture and conservation could maintain cultural landscapes—could thus gain more support for land protection and supporting productive use of land.
- If we monetize ecosystem services, how do we measure them? If we measure them, how do we translate that to a price? Since these payments don't exist at present, conservation organizations should work to support farm viability and conservation values
- How to share what was learned here? Will post talks and develop a web site, put together a published paper.
- Will also follow up with collaborative research projects