Solar Grazing

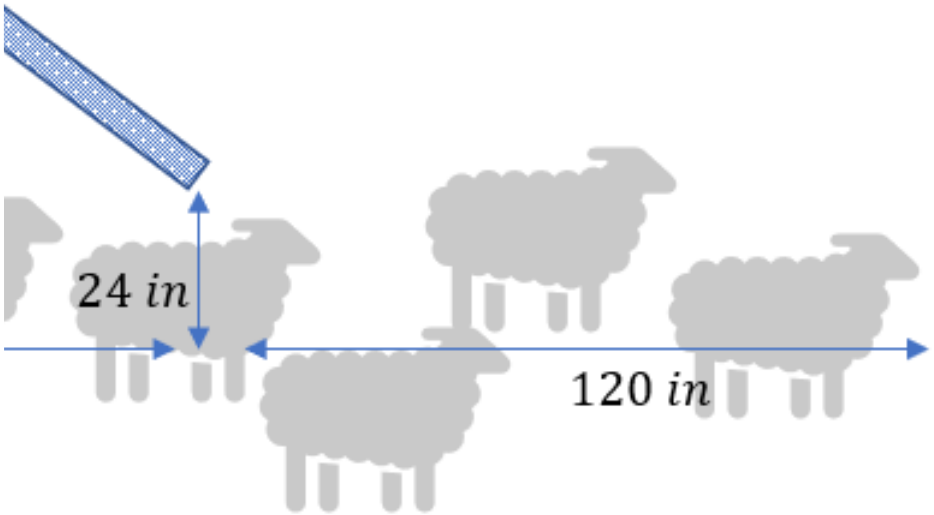
- PRESENTED BY –

Lexie Hain
American Solar Grazing Association

Solar arrays need vegetation management: Excessive shading and neglect of a solar site.


“The practice of using livestock to manage vegetation under solar arrays”

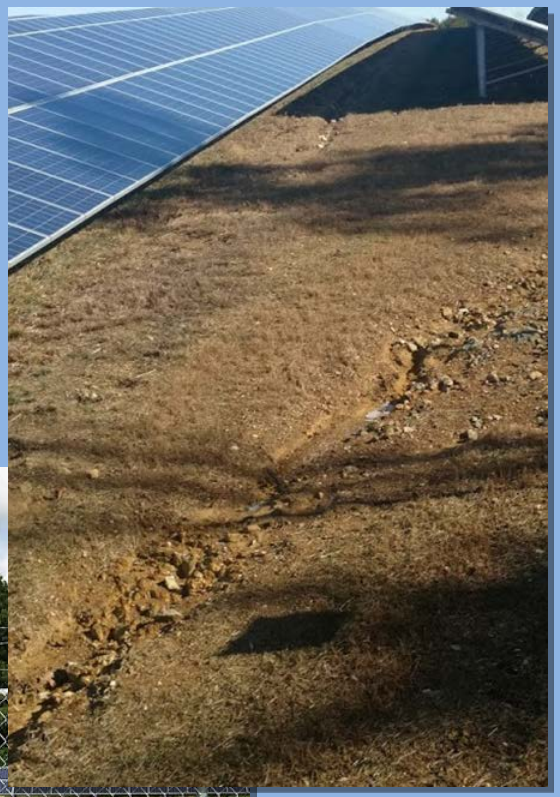
Solar Grazing Versus Mowing, Herbicides & Weed-wacking: Vegetation Maintenance



Sheep fit under the panels

Sheep maintain the vegetation under the panels better than people do

Disadvantages to mechanical & chemical regimes



- greater herbicide use
- more time spent by employees under panels
- poor mower performance at steep sites
- erosion: more likely with heavy herbicide use and a lack of perennial plants
- turfgrass and gravel: poor compatibility with pollinator plantings
- low agricultural community value

Using sheep eliminates or reduces:

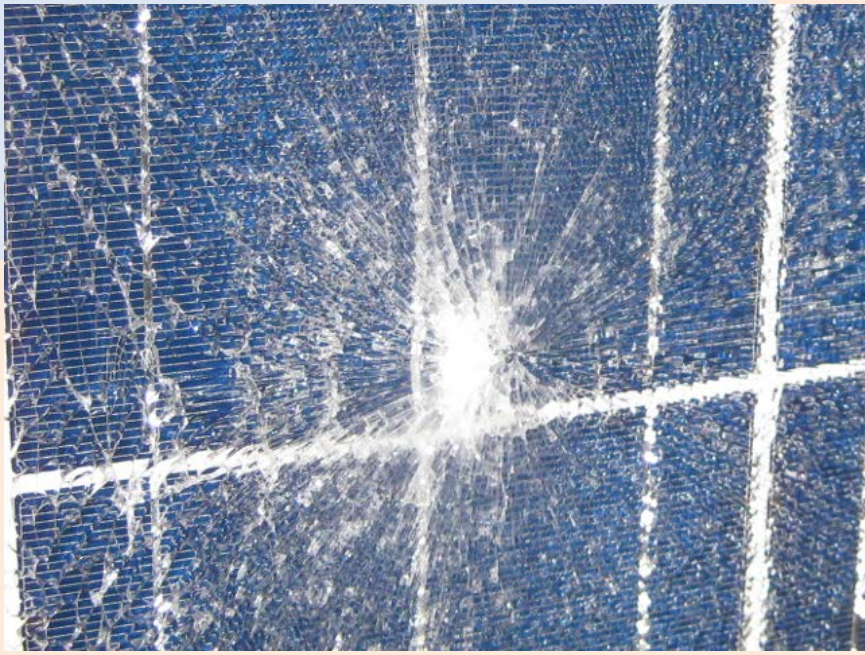
-Rocks and debris striking panels during mowing

-Injuries to landscapers working under panels

-Humans, wildlife and water exposure to herbicides

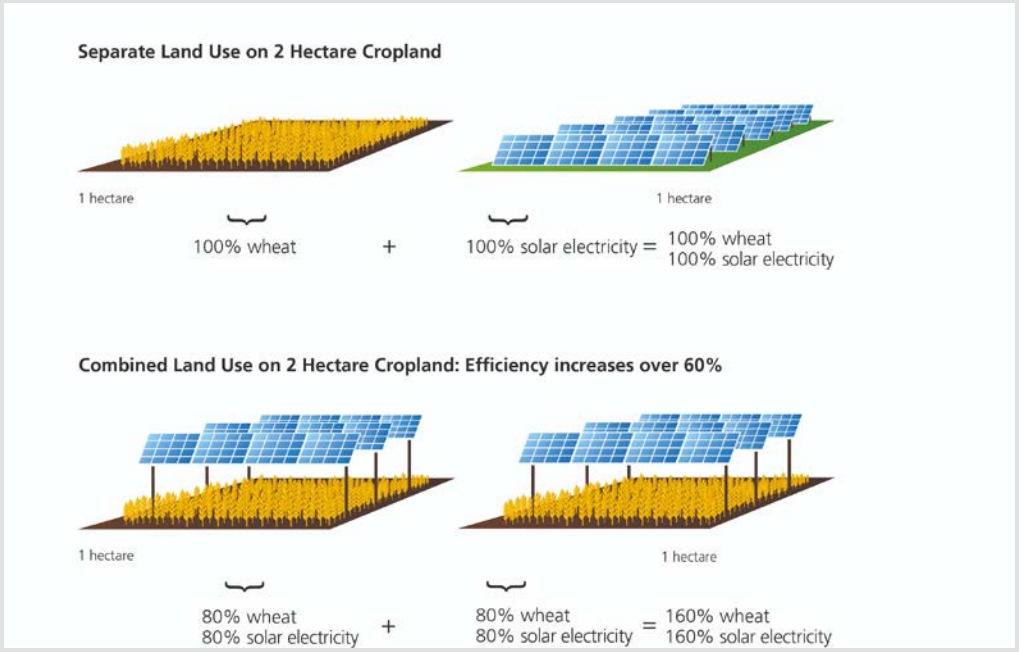
-Injuries to mechanical equipment and equipment operators

-Collisions and damage to solar infrastructure



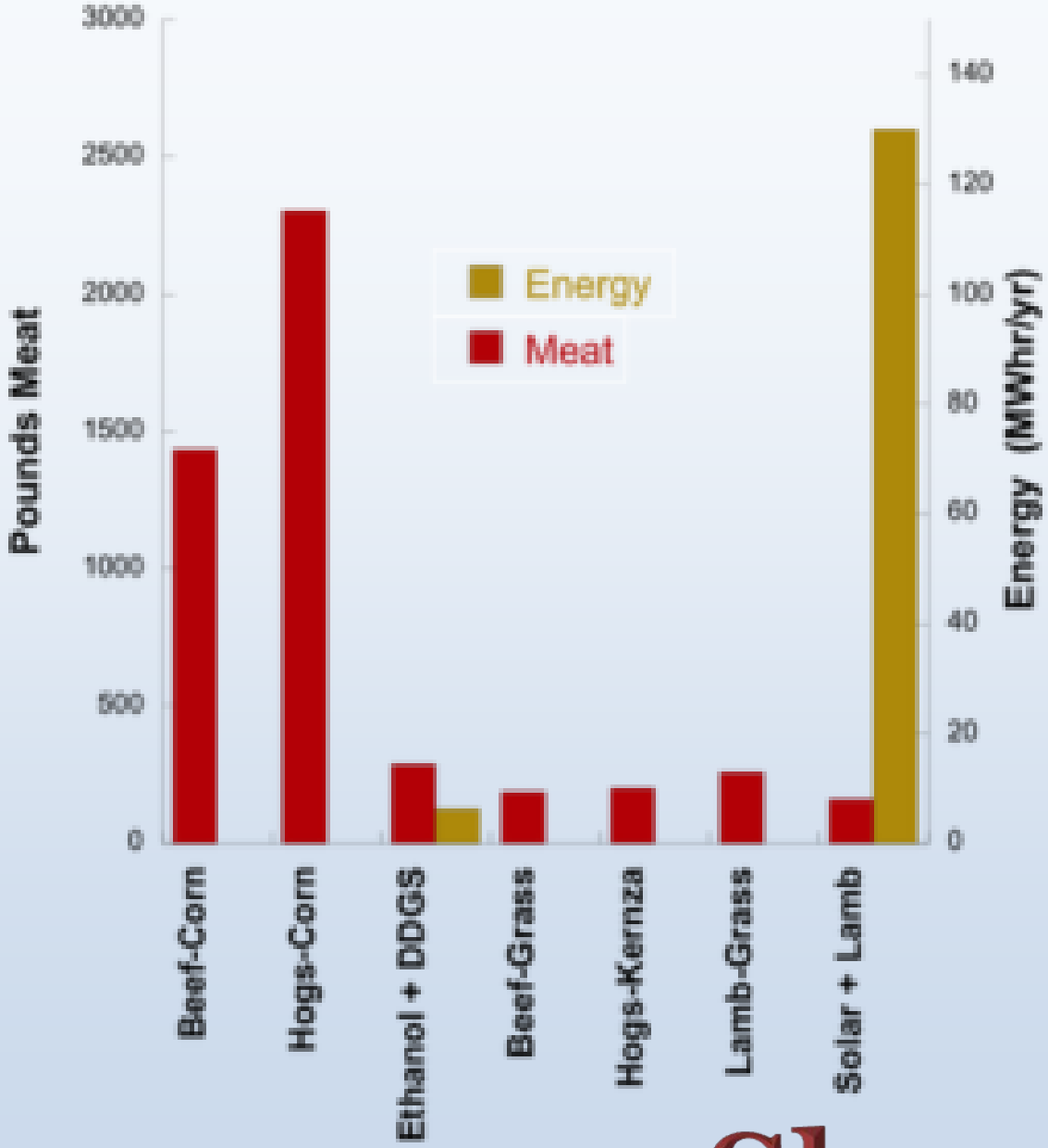
Advantages of using sheep to manage vegetation:

-it's effective
-compatible with pollinator projects / plantings
-keeps land in agricultural use
-good publicity for the solar companies
-permanent pasture can absorb atmospheric carbon in soil
-typically reduces maintenance expenses for solar companies



Sheep + Solar

-dual use
-co-location
-agrivoltaic



An acre of solar panels can provide 20 times the energy produced from an acre of corn grown for ethanol, plus pollinator habitat, and nearly as much meat. Three million acres of cropland in Minnesota are used for ethanol and byproducts.

https://scwrs.wordpress.com/2019/06/26/butterflies-blue-greens-kilowatts-and-calories/

Sheep + solar

Introducing…

SOLAR Sheep LLC

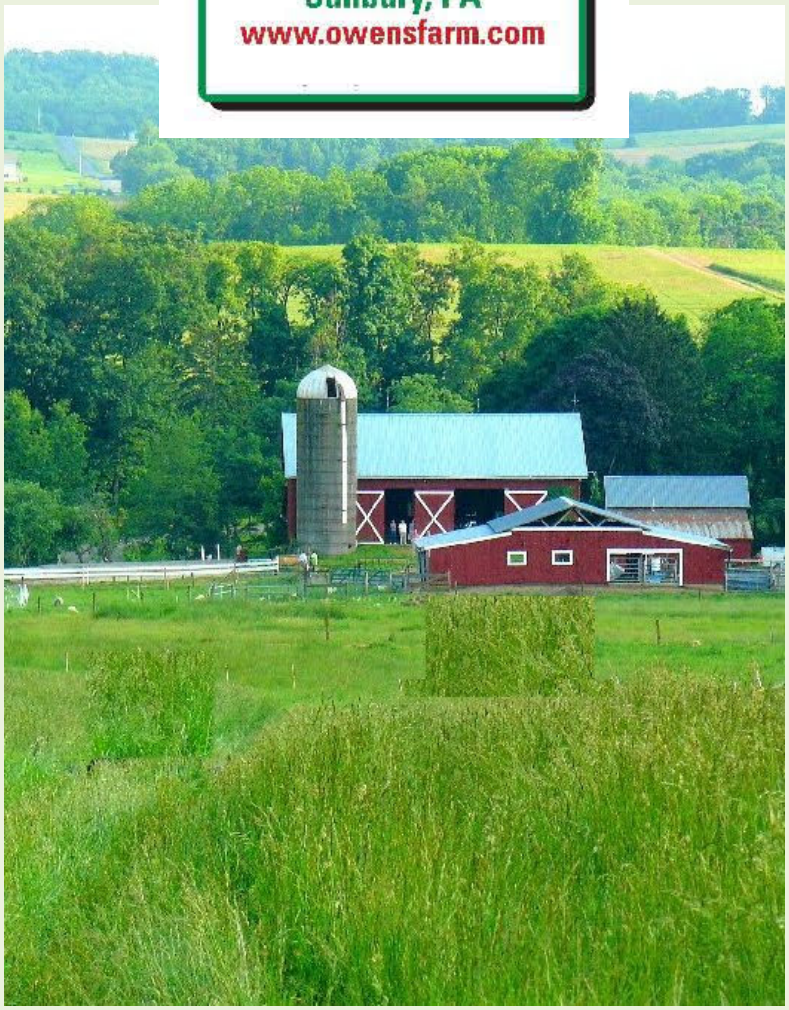
- 5 years experience
- 100% woman owned
- Southern New Jersey based
- Grazing with 2 firms on 3 + sites annually
- Fixed ground mount & single axis trackers
- Katadhin sheep
- Registered Katadhins
- Direct market 100% lambs
- http://www.solarsheepllc.com/

SOLAR Sheep LLC

SOLAR Sheep LLC

SOLAR
Sheep LLC

Owens Farm
-one solar array grazed
-14 acres, 1 year
-At Susquehanna University
-lambing classes
-integrated solar grazing with diverse farming operation



OWENS FARM
Grass-Fed Meats & More
Sunbury, PA
www.owensfarm.com

OWENS FARM
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www.owensfarm.com


WARNING
WARNING
CPS
WARNING


OWENS FARM
Grass-Fed Meats & More
Sunbury, PA
www.owensfarm.com

Family farm in Central NY
-solar grazing 3 years
-base flock 300 Katadhins +
-selling lambs, rams
-Agrivoltaic Solutions partner
-www.foxfarmsgrassfed.com

-New York State based
-farmer owned & operated
-work with partner shepherds to expand territory
-grazes community solar projects
-at the core of my farm enterprise

AGRIVOLTAIC
SOLUTIONS

American Solar Grazing Association

Not-for-Profit Trade association
ASGA's goal is to promote solar grazing through education & research

-founded in 2018
-farmer led iniative
-resources for
sheep + solar

Solar site tours: grazed arrays

FUZZ & BUZZ

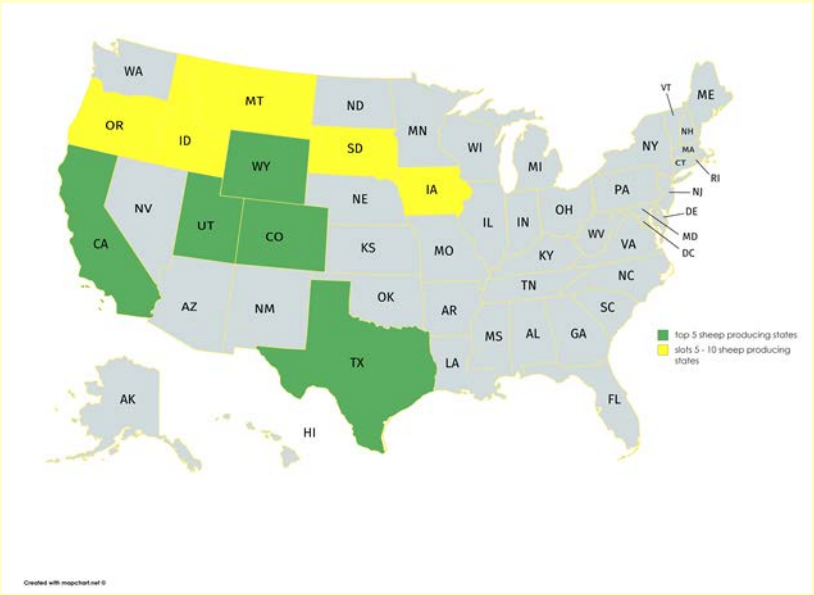
www.solargrazing.org

ASGA

https://pv-magazine-usa.com/2020/01/22/tinder-except-for-solar-and-sheep/

A new resource to connect farmers & solar developers:

SOLAR + SHEEP MAPPING (AND MATCHING) TOOL



Hudson Valley Solar Farm Model: Public version

Instuctions: be sure to fill in your farm's yellow highlighted areas with the relevant data first. Then you can manipulate the pink columns to true

Fenced project area				150		Solar Lease income per acre		750		
# of sheep per acre				3.5		Maintenance contract per acre		450		
# of sheep, total				525						
Average auction price for lamb, 90 lbs				225		225	212			
Average auction price per ewe, 100 lbs				85		90	75			
Average auction price per utility ewe, 130 lbs				65		2.5	2.826666667			
					YEAR 1	**YEAR 2**	**YEAR 3**	**YEAR 4**	**YEAR 5**	
birth rate						1.5	1.5	1.5	1.5	
lambs born					0	788	649	678	633	
size of flock, after lambing					525	1313	1231	1222	1164	
# of young ewes, after loss						0	149	92	109	
# of mature ewes, after loss					525	517	433	452	422	
loss rate for ewes						1.5%	1.5%	1.5%	1.5%	
% lambs to sell						80%	85%	83%	85%	
loss rate for lambs						4%	4%	4%	4%	
remaining lambs for sale & maturity						756	623	651	607	
% culls, young ewe						4%	10%	3%	3%	
% culls, older ewe						15%	25%	25%	20%	
# lambs to sell						605	530	540	516	
# ewe to sell, young						0	15	3	3	
# ewe to sell, old						78	108	113	84	
lamb income						$136,080	$119,238	$121,519	$116,175	
ewe cull income						$5,042	$8,302	$7,578	$5,762	
size of flock, end						591	552	539	534	
INCOME					**YEAR 1**	**YEAR 2**	**YEAR 3**	**YEAR 4**	**YEAR 5**	
SOLAR GRAZING ENTERPRISE										
	Sheep				$0	$141,122	$127,540	$129,097	$121,936	
	Solar lease				$112,500	$112,500	$112,500	$112,500	$112,500	
	Vegetation maintenance contract				$67,500	$67,500	$67,500	$67,500	$67,500	
TOTAL SOLAR GRAZING INCOME					$180,000	$321,122	$307,540	$309,097	$301,936	
COSTS of GOODS SOLD			Driver	Factor						
	Sheep costs									
		Feed			$46,653	$55,890	$59,904	$56,894	$55,153	
		Supplements & Minerals	per ewe	7	$3,675	$3,620	$4,073	$3,808	$3,716	
		Vet care, per lamb	per lamb	4.5	$0	$3,544	$2,922	$3,050	$2,847	
		Vet care, per ewe	per ewe	1.8	$945	$931	$1,047	$979	$955	
		Vet care, service	year	1000	$1,000	$1,000	$1,000	$1,000	$1,000	
		Bedding	per ewe	8.5	$4,463	$4,396	$3,680	$3,841	$3,586	
		Hauling Service	1860	3		$5,580	$4,889	$4,983	$4,764	
		Pasture seeding	15%	130	$2,925	$2,925	$2,925	$2,925	$2,925	
		Pasture maintenance	30%	45	$2,025	$2,025	$2,025	$2,025	$2,025	
		Lamb check-off	per head, slaughter	0.42	$0	$254	$223	$227	$217	
	Total Sheep Costs				*$61,685*	*$80,164*	*$82,689*	*$79,732*	*$77,188*	
	Solar lease & Maintenance Costs									
		Shepherd	salary	45000	$45,000	$45,000	$45,000	$45,000	$45,000	
		Payroll, field staff	1000	$15	$15,000	$15,000	$15,000	$15,000	$15,000	
	Total Solar & Maintenance Costs				*$60,000*	*$60,000*	*$60,000*	*$60,000*	*$60,000*	
TOTAL COGS					$121,685	$140,164	$142,689	$139,732	$137,188	
GROSS MARGIN					$58,315	$180,958	$164,850	$169,365	$164,749	
					32%	56%	54%	55%	55%	
EXPENSES										
	General & Administrative									
		Marketing	% sheep sales	2%	$0	$2,822	$2,551	$2,582	$2,439	
		Banking	budget	250	250	250	250	250	250	
		Dues	budget	1500	1500	1500	1500	1500	1500	
		Travel	budget	1000	1000	1000	1000	1000	1000	
	Total G&A				$2,750	$5,572	$5,301	$5,332	$5,189	

Feed cost chart:
Days of Grazing
Days of Winter
Feed type:
Units for feed
Cost per Unit
Per ewe:
Pounds per day per ewe
Feed Cost per year per ewe
Days for grain supplement, ewes in pregnancy, pounds per ewe
Feed cost for supplement, per ewe
Per Lambs:
Days at weaning
Days (age) at sale
% of lambs on bottles
Days of milk replacer, pounds per day
Cost of milk replacer, per lamb on bottle
Days of creep feed, average pounds per day per lamb
Cost of creep feed per lamb
Days for early & late season supplemental feed for lambs, pounds per day
Cost for early/late season supplemental feed for lambs

ASGA

It’s a business: Farmer Costs

Credit to 2019 Atkinson Center Report

Table 2. Income statement for grazing 56 sheep on 22 acres.			
Item	Total	Per acre	Per head of sheep
Investment	$1,690	$77	$30
Grazing income			
Directly contracted	$11,000	$500	$196
Subcontracted	$5,500	$250	$98
Grazing expenses			
Mileage	$2,125	$97	$38
Labor	$2,084	$95	$37
General liability insurance	$1,500	$68	$27
Directly contracted total	$5,709	$260	$102
Subcontracted total	$4,209	$191	$75
Net			
Directly contracted	$5,291	$241	$94
Subcontracted	$1,291	$59	$23

DAVID R. ATKINSON CENTER
for a Sustainable Future

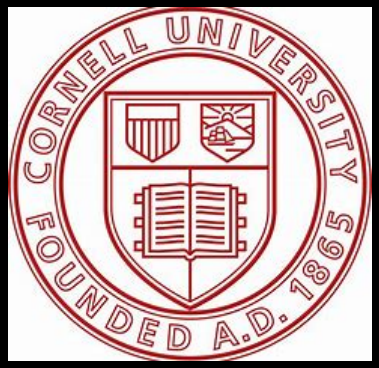
Using sheep is more efficient and cost effective than using landscaping services

"Utilizing sheep for site vegetation management required a total of 139 hours including travel time, resulting in 2.5 times fewer labor hours than traditional vegetation management (mowing and string trimming) on site."

Value added income potential:

ACTIVE:
•Bare Ranch, California: Climate friendly wool
•North Face: Threads With Benefits
•Sun Raised Foods: meats by mail order all grazed in North Carolina
•Honey products

California Fibershed has 2 farmers who are solar graziers
www.youtube.com/watch?v=TdcsWIxOrbs&feature=youtu.be



DAVID R. ATKINSON CENTER
for a Sustainable Future

$ PER ACRE, PER YEAR

Per acre income and expense of solar grazing in New York and across the eastern United States.

Eastern United States	Directly contracted	Subcontracted
Income	$326	$308
Expenses	$64	$64
Net	$262	$244

New York State	Directly contracted	Subcontracted
Income	$555	$320
Expenses	$46	$46
Net	$509	$274

Solar grazing: overview

TARGETED GRAZING – HOW WE DO IT

Arrival

Lead to the first paddock

Required for health: Water & Minerals

Regular flock checks, fencing moving, more..

Interior paddocks: temporary

Interior paddocks: permanent

Perimeter Fencing: FERC

Recommended: A tensioned bottom edge meeting the ground
Typically: 6-7 ft tall, chain link

Gaps, Wildlife Passages & Repairs…

Excluding the Inverter Pads

Leading edge of the panel

That's low!

Lower panels mean more intense vegetation management

Sheep benefit from the easy access to protective cover, windbreak & shade

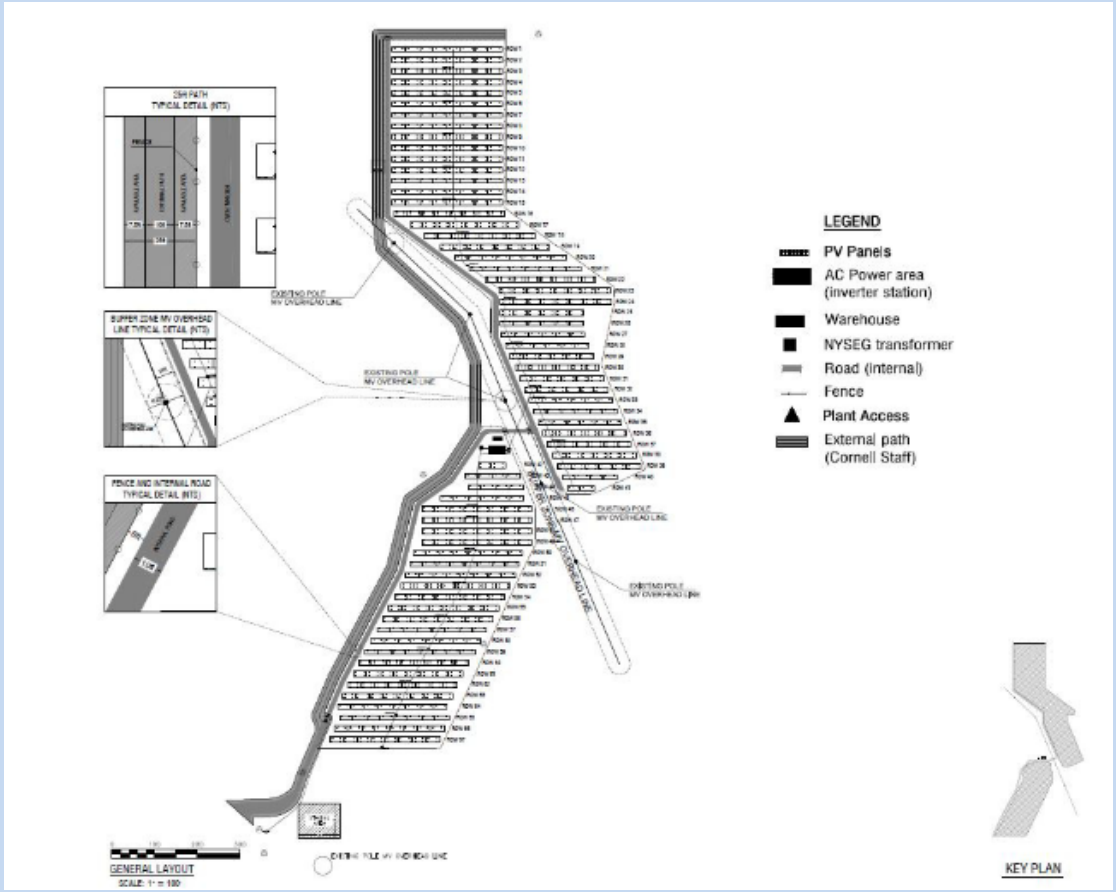
Trackers

Trackers: cable trays

CAB

Solar grazing can happen at any scale of ground-mounted solar

Utility: 50 acres +
Community: 10 to 50 acres
Commercial: 1 to 25 acres



Handling the sheep

Family friendly!

Solar grazing

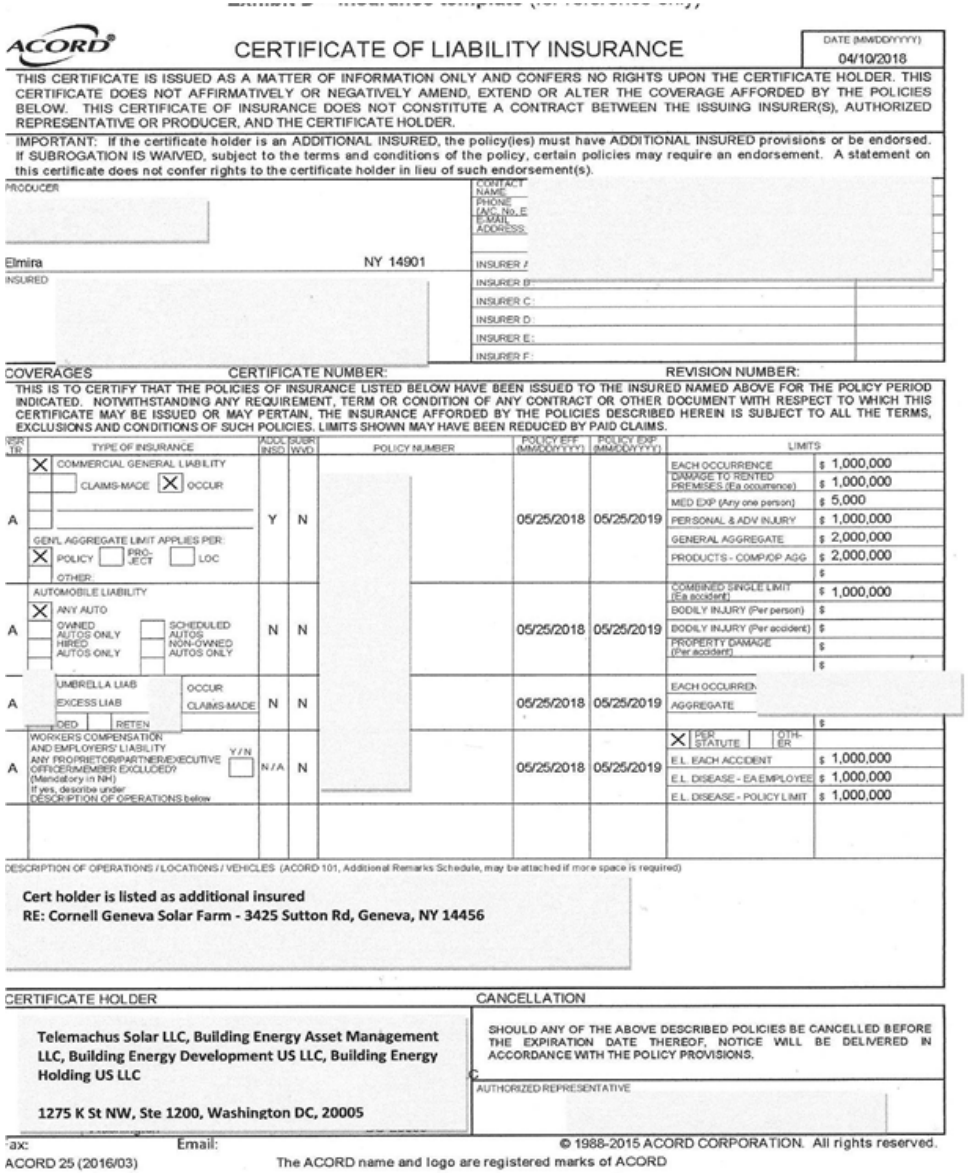
SOLAR SITE COMPLIANCE

Signs are needed

Electrical Contractors

Assurance of Animal Well Being & compliance with USDA regulations

Insurance



ACORD

CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY): 04/10/2018

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must have ADDITIONAL INSURED provisions or be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER

CONTACT NAME:
PHONE (A/C, No, E
E-MAIL ADDRESS:

Elmira NY 14901

INSURER A:

INSURED

INSURER B:
INSURER C:
INSURER D:
INSURER E:
INSURER F:

COVERAGES CERTIFICATE NUMBER: REVISION NUMBER:

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL INSD	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS	
A	X COMMERCIAL GENERAL LIABILITY CLAIMS-MADE X OCCUR GEN'L AGGREGATE LIMIT APPLIES PER: X POLICY PRO-JECT LOC OTHER:	Y	N		05/25/2018	05/25/2019	EACH OCCURRENCE DAMAGE TO RENTED PREMISES (Ea occurrence) MED EXP (Any one person) PERSONAL & ADV INJURY GENERAL AGGREGATE PRODUCTS - COMP/OP AGG	$ 1,000,000 $ 1,000,000 $ 5,000 $ 1,000,000 $ 2,000,000 $ 2,000,000
A	AUTOMOBILE LIABILITY X ANY AUTO OWNED AUTOS ONLY HIRED AUTOS ONLY SCHEDULED AUTOS NON-OWNED AUTOS ONLY	N	N		05/25/2018	05/25/2019	COMBINED SINGLE LIMIT (Ea accident) BODILY INJURY (Per person) BODILY INJURY (Per accident) PROPERTY DAMAGE (Per accident)	$ 1,000,000 $ $ $
A	UMBRELLA LIAB OCCUR EXCESS LIAB CLAIMS-MADE DED RETEN	N	N		05/25/2018	05/25/2019	EACH OCCURRENCE AGGREGATE	$
A	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? (Mandatory in NH) Y/N N/A If yes, describe under DESCRIPTION OF OPERATIONS below		N		05/25/2018	05/25/2019	X PER STATUTE OTH-ER E.L. EACH ACCIDENT E.L. DISEASE - EA EMPLOYEE E.L. DISEASE - POLICY LIMIT	$ 1,000,000 $ 1,000,000 $ 1,000,000

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (ACORD 101, Additional Remarks Schedule, may be attached if more space is required)

Cert holder is listed as additional insured
RE: Cornell Geneva Solar Farm - 3425 Sutton Rd, Geneva, NY 14456

CERTIFICATE HOLDER

Telemachus Solar LLC, Building Energy Asset Management LLC, Building Energy Development US LLC, Building Energy Holding US LLC

1275 K St NW, Ste 1200, Washington DC, 20005

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE

ax: Email:

ACORD 25 (2016/03)

Contract

Available at
Solargrazing.org
farmer resources

AMERICAN SOLAR GRAZING ASSOCIATION, INC.
SHEEP GRAZING AGREEMENT TEMPLATE

OPTION 1
(Comprehensive Vegetation Management Approach)

This template was developed by Savannah Bowling and Kasey Brenner, student attorneys at th Food and Beverage Law Clinic, in collaboration with the American Solar Grazing Association Inc. and Jonathan Barter, Julie Bishop, Ashley Bridge, Lewis Fox, Erica Frenay, Lexie Hain, Nik Zochendoerfer, and Caleb Scott. The Food and Beverage Law Clinic is a part of John Jay Lega Services, Inc., a non-profit legal services organization housed at the Elisabeth Haub School o Law at Pace University. The Food and Beverage Law Clinic represents farmers, food an everage entrepreneurs, and non-profit organizations seeking to improve our food system. Thi Document does not reflect or constitute legal advice. Your use of this document does not creat n attorney-client relationship with the Clinic or any of its lawyers or students.

NSTRUCTIONS FOR USING CONTRACT TEMPLATE: This contract represents Sheep Grazing Agreement – Option 1, which is a comprehensive vegetation maintenance approach whereby the sheep farmer agrees to maintenance of all vegetation, regardless of whether it i egetation that sheep typically eat or do not eat. This obligation means that in the event that th heep do not achieve the vegetation standard set forth in Section 1(b) of the contract, the shee armer is responsible for achieving that standard through some other means (for example, throug ne use of a landscaping service).

Option 1 v. Option 2: In contrast, Sheep Grazing Agreement – Option 2 represents a limite egetation management approach, whereby the sheep farmer agrees to maintenance of only th egetation that sheep typically eat, defined as "Covered Vegetation" in the contract. Types o egetation that constitute "Covered Vegetation" are determined by the contracting parties. Simila o Option 1, the obligation under Option 2 means that in the event that the sheep do not achiev ne vegetation standard for Covered Vegetation set forth in Section 1(b) of the contract, the shee armer is responsible for achieving that standard through some other means (for example, throug ne use of a landscaping service). The solar site manager is responsible for maintenance of al egetation that is not Covered Vegetation.

This contract is a template; it is not a one-size-fits all contract. All provisions that are *fre olded, italicized, and bracketed]* and all provisions with blank spaces (_____) and/o uidance footnotes should be addressed by the parties, in addition to any other changes th arties may negotiate. Carefully review all attached exhibits (Exhibits A – E). Note that th ertificate of liability insurance, attached as Exhibit D, is a sample only; parties to this contrac ust obtain their own insurance and replace this sample with their respective insuranc ertificates.

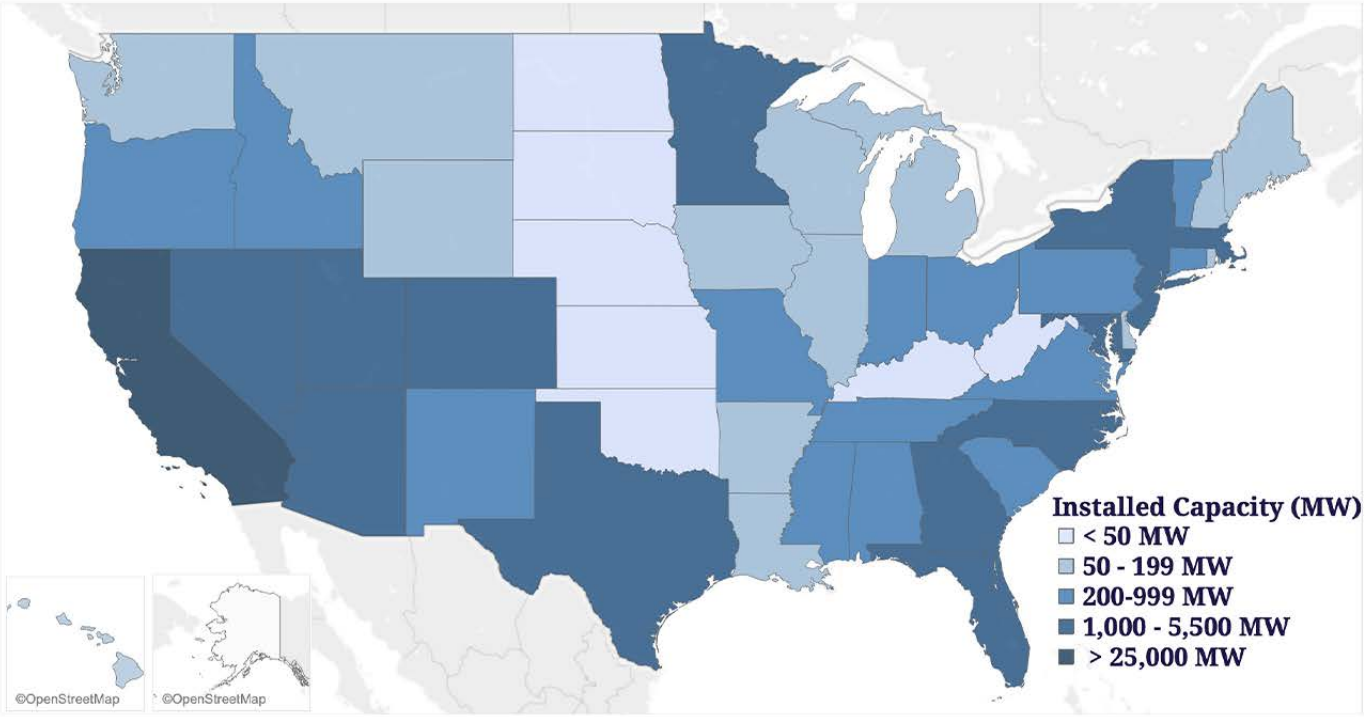
Once the contract is complete, **DELETE** all footnotes throughout the contract. This instructiona age is not part of the contract.

Solar Grazing

CASE STUDIES, TRENDS & & SUPPORTING RESEARCH

Where's the solar going?

Top 10 States	
California	25,016 MW
North Carolina	5,467 MW
Arizona	3,788 MW
Nevada	3,452 MW
Florida	3,156 MW
Texas	2,957 MW
New Jersey	2,829 MW
Massachusetts	2,535 MW
New York	1,718 MW
Utah	1,661 MW
Georgia	1,572 MW



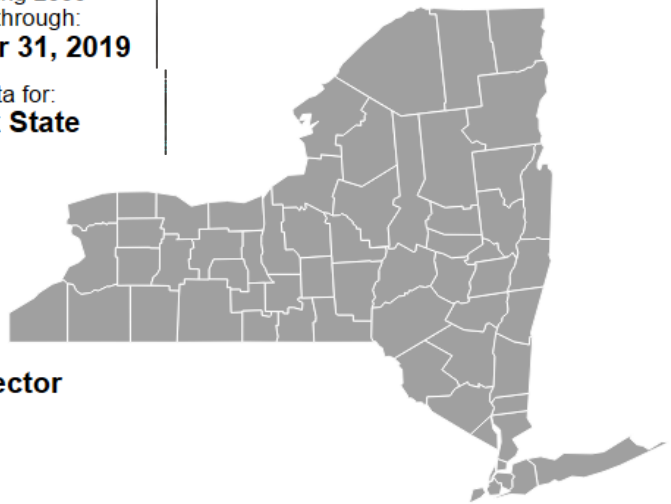
Wood Mackenzie POWER & RENEWABLES

SEIA Solar Energy Industries Association®

2019 SEIA Map Solar Installed Capacity

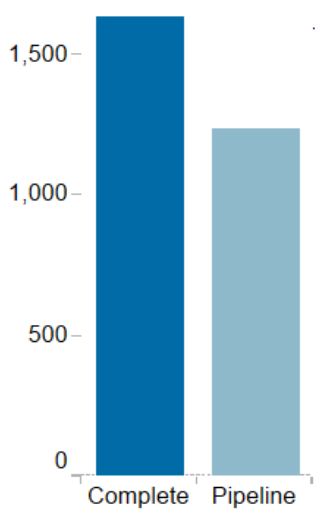
Data beginning 2000
and current through:
December 31, 2019

Showing Data for:
New York State

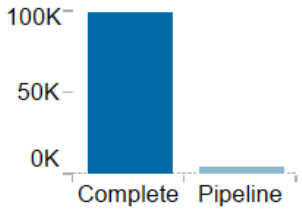


Project Sector
All

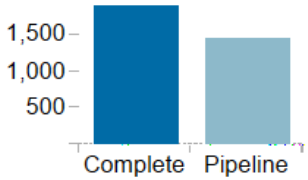
Total Capacity (MW DC)



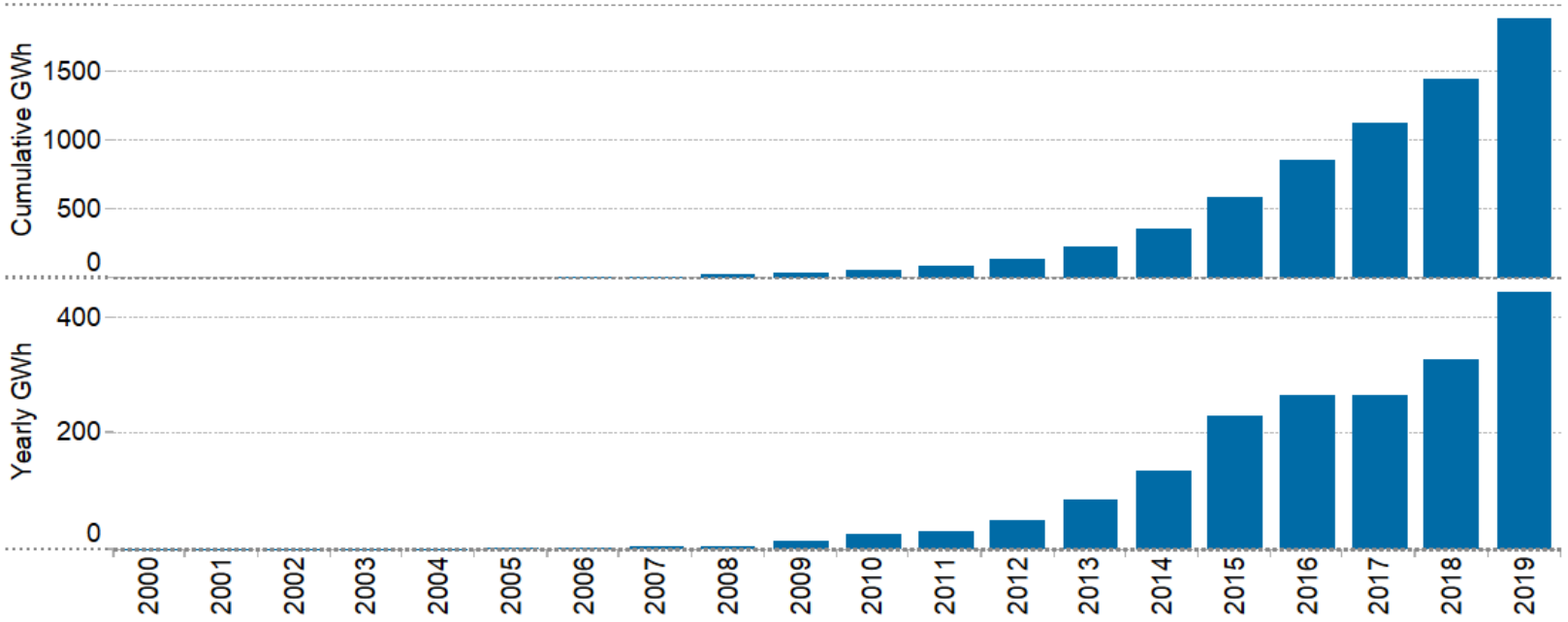
Number of Projects

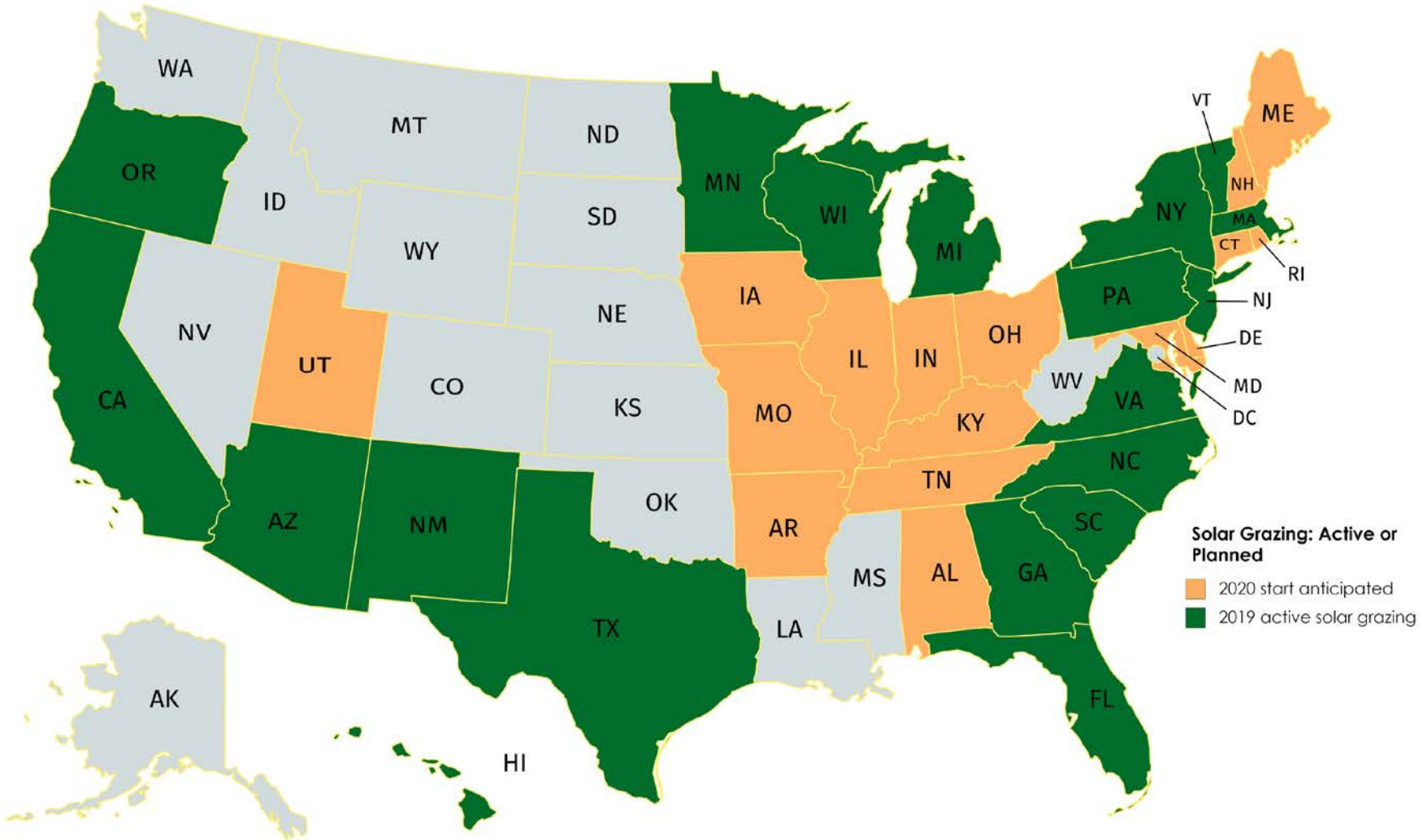


Expected Annual Production (GWh)



Annual Trends (Completed Projects Only) Expected Annual Production





Creating A Clean, Affordable, and Resilient Energy Future For the Commonwealth

DOER
Massachusetts Department of Energy Resources

COMMONWEALTH OF MASSACHUSETTS
Charles D. Baker, Governor
Karyn E. Polito, Lt. Governor
Matthew A. Beaton, Secretary
Judith Judson, Commissioner

Rhode Island College, Providence, RI

November 15, 2017

Land Use Policy in Massachusetts Solar Incentive Programs

Kaitlin Kelly
Renewable Energy Program Coordinator

Location Based Adders	
Type	**Adder Value ($/kWh)**
Agricultural	$0.06
Building Mounted	$0.02
Brownfield	$0.03
Floating Solar	$0.03
Landfill	$0.04
Solar Canopy	$0.06

Solar Grazing Business Models

A. Independent contractor
   1. FARMER Led: Farmer contracts with solar O & M asset manager, or network of farmers contract for the same service. Includes farmer-landowner-shepherds.
   2. LANDSCAPER Led: Landscape Contractor uses sheep as a tool

B. SOLAR COMPANY Led: Solar company starts internal O & M, uses sheep, hires shepherd.

200 Acres in Eastern Ontario grazed for EDF Renewables

Shady Creek Lamb Co

A1

Frank Iturriria

Topaz Solar Farm
3400 Acres
550 MW

A1

A + Environmental Restoration

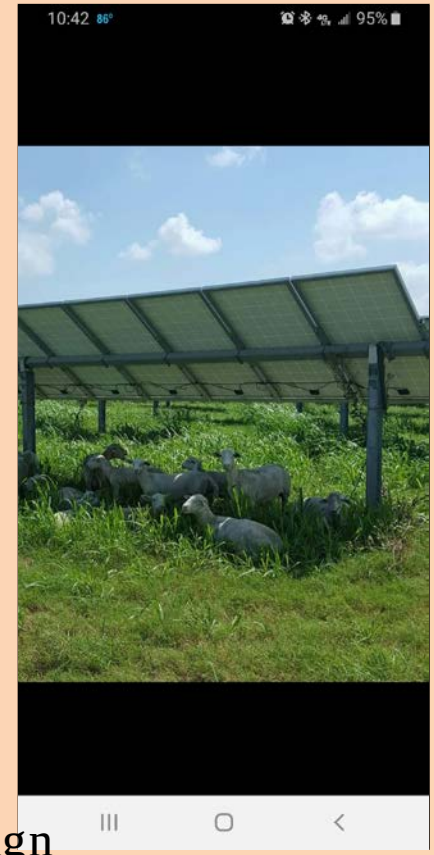
Ecological Services Firm

Florida Based: TECO & FP&L

Grazing over 1200 acres May 2019

A2

EVARanch
SAN ANTONIO, TX



-maintains vegetation & washes panels
-Texas & NM
-each site grazed 3 times/year
-300 acres grazed, 1600 acres total managed
-sheep spend 30/40 days on a site then are moved to the next location
-buttons/switches that sheep can accidentally press- one design issue
-emus as guardian animals
-Johnson grass, Bermuda grass, native grass, coastal grass & clover for cool season
-growing sheep operation to 1500 ewes

A2

Sun Raised Farms, North Carolina

Thousands of acres undermanagement

Tanje Olsen & Joel Olsen

BACKGROUND

The Montgomery Solar Farm began in 2013 when Biscoe resident Bobby Myrick connected O2 emc with CJ Reynolds. Reynolds was interested in converting the former Tobacco Stick Hunting Preserve into a solar farm without losing its agricultural function. In 2015, 120 acres of the property were converted to a 20 Megawatt AC solar farm, with about 60 acres "under glass."

Each year, the solar farm will generate over 40,000 megawatt-hours of clean electricity during times of peak demand. This is equivalent to the amount of electricity that 3,500 average American homes consume annually. Sheep graze the land under the panels during warmer months to maintain the site, demonstrating the land's dual use.

work for over 300 individuals and over 20 contractors and sub-contractors.

A

Michael Baute
Director of Regenerative Energy
Michael.baute@siliconranch.com
629-202-4028

- Grazing 1 site in Colorado for the second year
- Large network expansion plans
- Focus on soil heath & carbon sequestration
- Partner with area farmers & landowners.

B

https://vimeo.com/343472549

- La Jacinta, Uruguay
- 500 + acre 65 MW

Invenergy

Carolina Solar SERVICES

SERVICES
•400 acres grazed
•360 sheep managed
•Founded 2014
•North Carolina based

SERVICES
•Grazing livestock management
•Site assessment for viability of grazing
•Forage seeding assessments and recommendations
•Site improvements for livestock

B

"We are proud to provide a vegetation management solution that enables electricity to be generated on the same land where sheep are raised."
-Brock Phillips
Director of Livestock Service

Solar grazing

TOOLS FOR MANAGING VEGETATION: OR, HOW IT'S DIFFERENT FROM A REGULAR PASTURE

Achieving solar pastures

Seed Mix & Planting Plan

-cover crops & nurse crops
-low impact seeding strategies

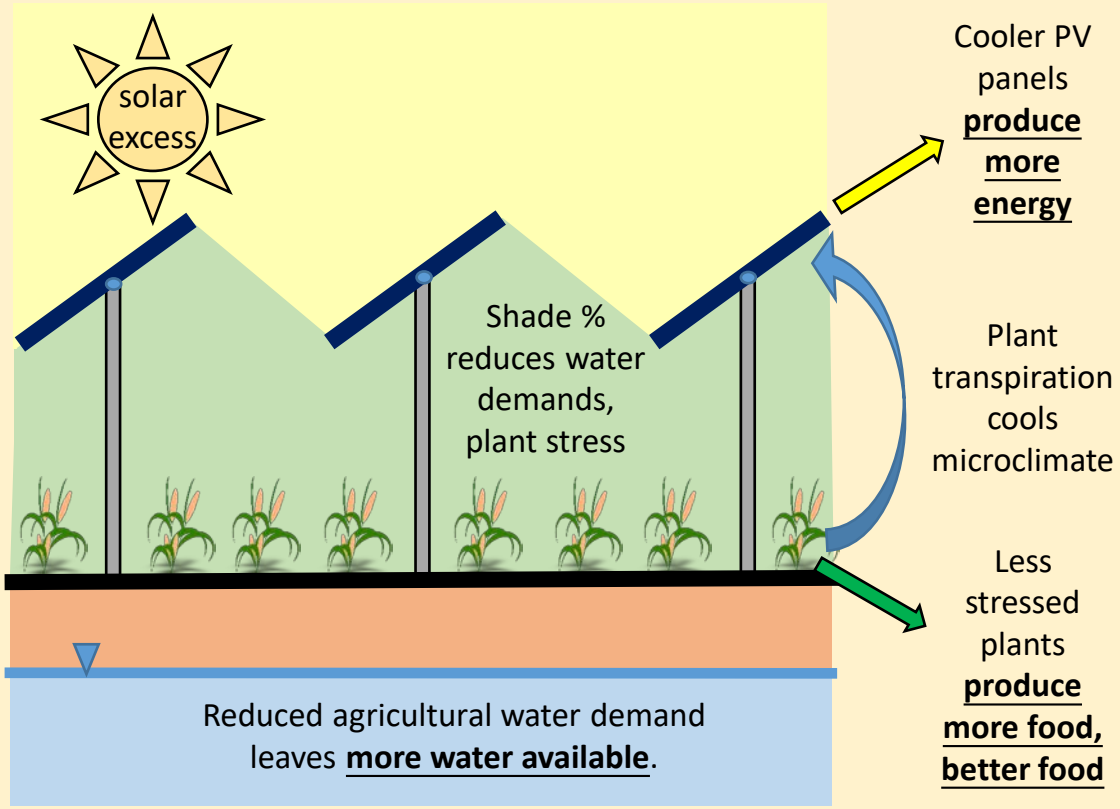
-goal: permanent pasture

Fuzz and Buzz

Factors:

-spacing between panels
-panel height
-panel movement
-Blue Wave's dual use shading analysis tool video

Oregon State's Dual Use Results



- Solar panels led to an 300%+ increase in the water use efficiency of the cropping system
- Solar panels led to a 90% increase in biomass production of the cropping system
- Solar panels are projected to be more productive when placed over cropping systems

https://openei.org/wiki/InSPIRE/Guidebook

Low-Impact Development Strategies

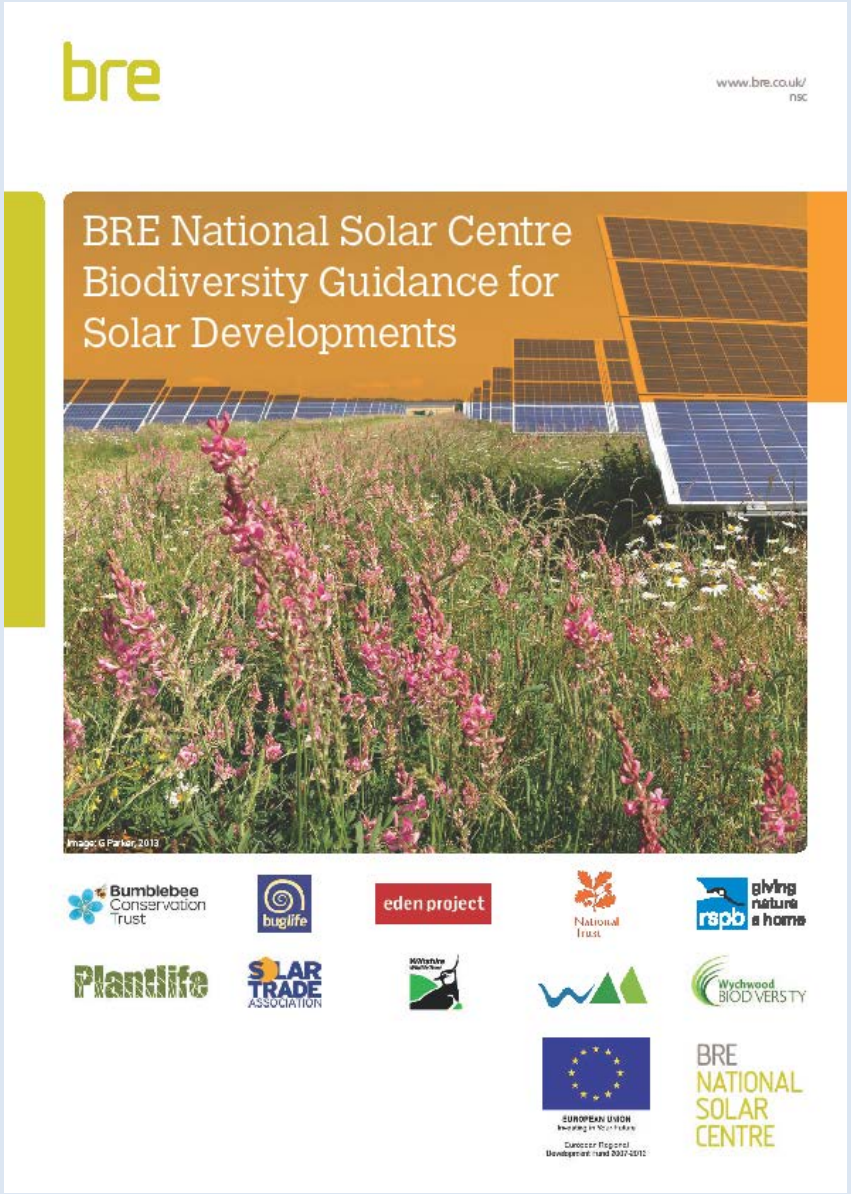
Agricultural Co-Location

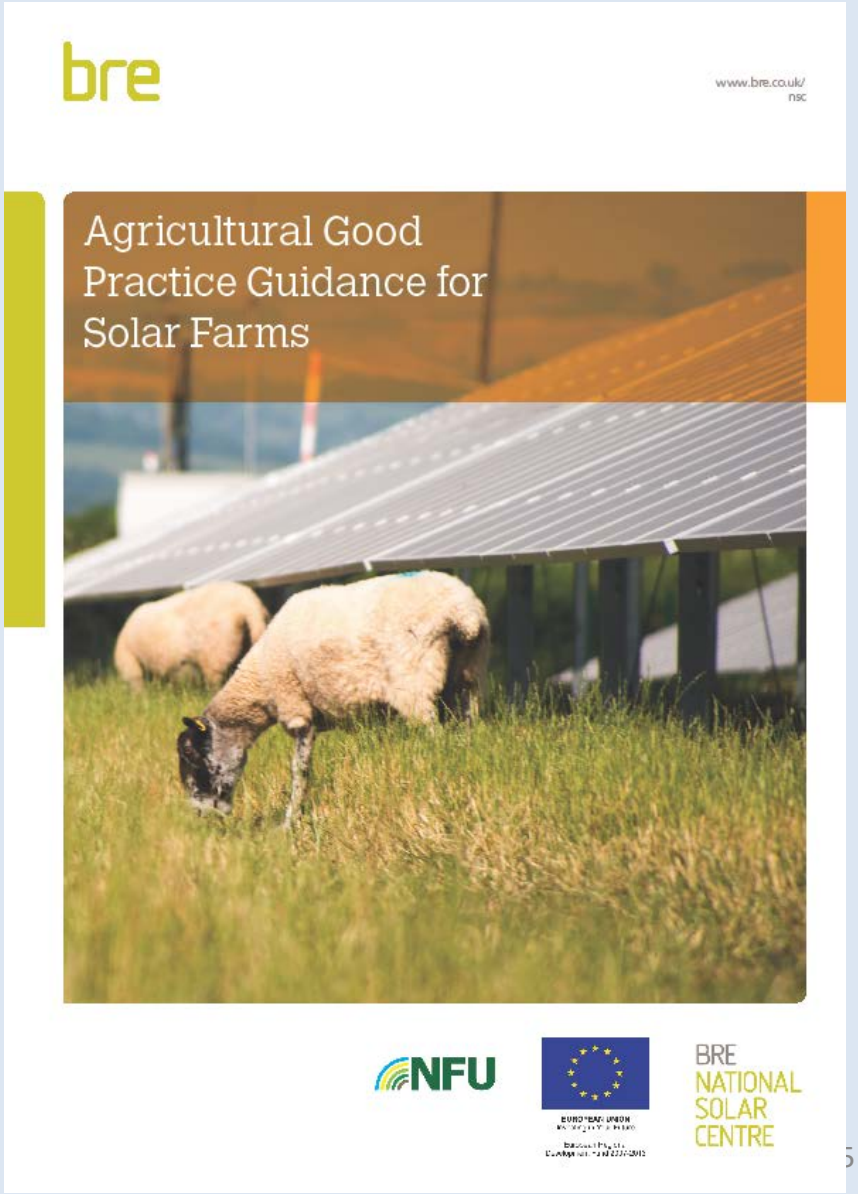
Agricultural O&M Considerations

NATIONAL RENEWABLE ENERGY LAB (NREL)

INSPIRE PROJECT

Resources for successful co-location: case studies in the UK





a necessary part of the planning process

PRESCRIBED GRAZING PLAN FOR SOLAR ARRAYS

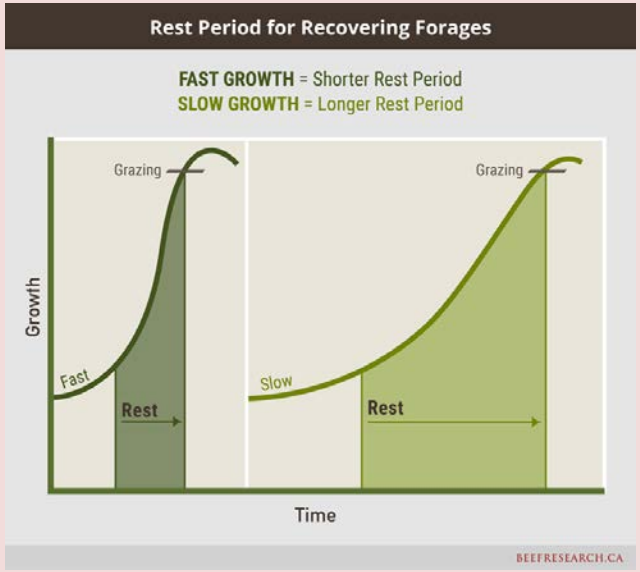
Prescribed Grazing Plan:

Plan to: Manage the harvest of vegetation with grazing animals

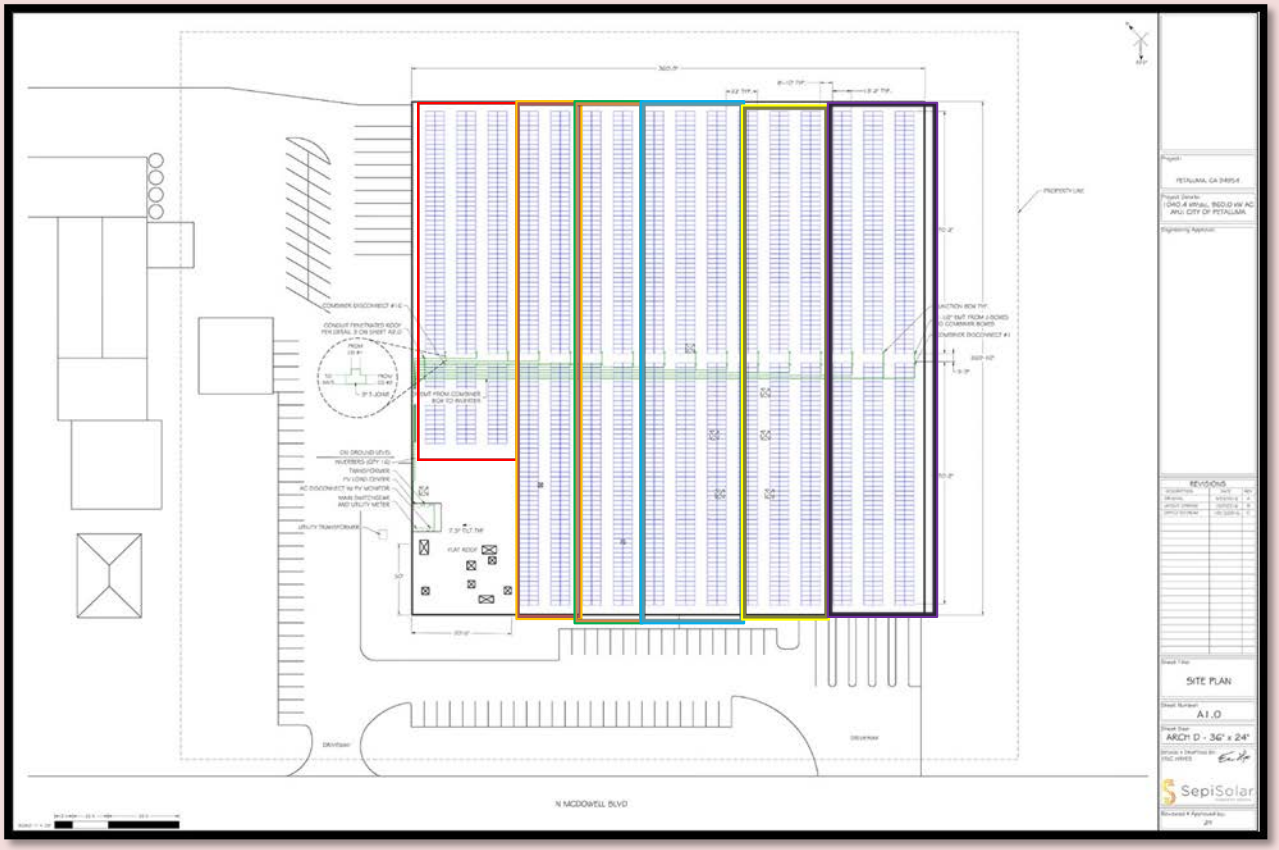
USDA

Includes:

- Goals
- Resource inventory
- Fencing
- Water / water systems
- Predator control
- Maps, charts
- Will be specific to each solar site



Prescribed Grazing Plan



- **X** sheep per paddock
- **Y** days per paddock
- **Z** total sheep for solar site

- Section 1 (x acres) 5 individually, permanently fenced arrays 10 grazing paddocks
- Section 2 (x acres) 5 individually, permanently fenced arrays 15 grazing paddocks
- Section 3 (x acres) 6 individually, permanently fenced arrays 15 grazing paddocks
- Section 4 (x acres) 6 individually, permanently fenced arrays 15 grazing paddocks
- Section 5 (x acres) 6 individually, permanently fenced arrays 15 grazing paddocks

Solar grazing: natural compliments

SHEEP, BEES & POLLINATORS

Co-location of bees & sheep done as an afterthought in many locations

Commercial bee yard

State by state:
Pollinator scorecards
Pollinator friendly solar checklists

Michigan Pollinator Habitat Planning Scorecard for Solar Sites

This form was developed by the MSU Department of Entomology to guide vegetation management at solar installations to make them more supportive for native pollinators. Check the boxes and add up the points to determine whether the plans meet or exceed the minimum requirements. For more local information on pollinators and habitat: www.pollinators.msu.edu

PROJECT DETAILS

Solar developer:_____

Vegetation consultant: _____

Project location: _____

Project size (acres):_____

SITE SCORES

1. SITE PLANNING AND MANAGEMENT
   - ☐ Detailed plant establishment and vegetation management plan developed +10 pts
   - ☐ Site plan developed with a vegetation management company + 5 pts
   - ☐ Signage legible at forty or more feet stating pollinator friendly solar habitat +3 pts

2. HABITAT SITE PREPARATION PRIOR TO IMPLEMENTATION
   - ☐ Measures taken to control weeds during season prior to seeding +10 pts
   - ☐ No weed control -20 pts

3. INSECTICIDE RISK
   - ☐ Planned on-site use of insecticide or pre-planting seed/plant treatment (excluding buildings/electrical boxes, etc) -40 pts
   - ☐ Communication with local chemical applicators and site registered on https://mi.driftwatch.org/map +20 pts

4. AVAILABLE HABITAT COMPONENTS WITHIN 0.25 MILES (check/add all that apply)
   - ☐ Native bunch grass for bee nesting +1 pt
   - ☐ Open sandy soil areas for bee nesting +1 pt
   - ☐ Trees/shrubs for bee nesting +1 pt
   - ☐ Clean, perennial water sources +1 pt

FLOWERING PLANT SCORES

5. FLOWERING PLANT SPECIES SEEDED IN PERIMETER AREA (species with more than 1% cover)
   - ☐ 5-10 species +1 pts
   - ☐ 10-15 species +3 pts
   - ☐ 16-20 species +8 pts
   - ☐ >20 species +10 pts

   Exclude invasive plant species from total

6. PLANT DIVERSITY UNDER SOLAR ARRAY*
   - ☐ Grass only +2 pts
   - ☐ Clover/grass mix +8 pts
   - ☐ Low-growing wildflower mix +10 pts

7. PERCENT OF SITE PLANNED TO BE DOMINATED BY WILDFLOWERS**
   - ☐ 0 - 25% 0 pts
   - ☐ 26- 50 % +3 pts
   - ☐ 51-75 % +8 pts
   - ☐ More than 75% +15 pts

   Projects may have different species mixes under the solar array panels and in the perimeter. Flower cover should be averaged across the entire site.

8. SEEDS USED FOR WILDFLOWER AREAS
   - ☐ Mixes are seeded using at least 40 seeds/square foot +5 pts
   - ☐ All wildflower seeds are from a source within 150 miles of the site +5 pts

9. SEASONS WITH AT LEAST THREE BLOOMING FORB SPECIES PRESENT (check all that apply)
   - ☐ Spring (April-May) +5 pts
   - ☐ Summer (June-August) +5 pts
   - ☐ Fall (September-October) +5 pts

** For seeding in the panel array, these can be a short-stature wildflower mix or clovers and other non-native species beneficial to pollinators. If clovers are used, these should be seeded in locations separate from the native wildflowers in the perimeter locations.*

*** Wildflowers in Question 7 refer to forbs which are flowering plants that are not woody, and are not grasses, sedges, etc. Measurements of percent cover should be based on the percent of the ground surface covered by foliage as viewed from above.*

Refer to www.nativeplants.msu.edu or a local native wildflower supplier for advice on plants that are attractive to pollinators and will work in various Michigan settings.

For more on pollinator habitat: www.pollinators.msu.edu

Total points: ☐

Provides exceptional habitat	**90+ points**
Meets pollinator standards	**76 – 89 points**
Does not meet standards	**below 75 points**

MICHIGAN STATE UNIVERSITY | Extension

NEW STUDY:

Cornell's Atkinson Center for a Sustainable Future

Grazing Sheep on Solar Array Sites to Optimize Pollinator Plant Species and Sequester Soil Carbon

Principal investigator (PI): Michael L. Thonney
Co-investigators: Scott McArt, Johannes Lehmann

Start and duration: July 2019, lasting 36 months

Keywords: Solar Grazing, Carbon Sequestration, Pollinator Habitat

Not just mowing costs versus grazing costs…

FUTURE OPPORTUNITIES

https://www.solarshepherd.com/

SOLAR SHEPHERD

How using solar grazing connects to Finance & Insurance:

Insurers covering ground mounts factor the above risks into their calculations when determining premiums charged to PV array operators. By establishing grazing as the method for managing vegetation, operators eliminate these risks. This may allow insurers to reduce premium charges. By offering a reduced insurance premium cost for those firms maintaining vegetation with sheep, an insurer can be more competitive on price and gain a larger share of the growing PV ground mount market.

OPPORTUNITY TO SHIFT THE TAX FRAMEWORK

Department of Assessment

128 East Buffalo Street

Jay Franklin
Director

Inclusion through Diversity

Irene Kehoe
Assistant Director

Solar and Agricultural Land Exemptions

The memo is meant to act as a guide as it related to certain topics involving large scale solar development and how that interacts with the Agricultural Land Exemption. This is not meant to answer all questions related to this topic. Also, changes in how the current law is interpreted or any legislative changes to the law might change the points in this memo. And this is only applicable in Tompkins County.

- Land that previous had an agricultural land exemption on it would be subject to the roll back conversion penalty if that land that benefitted from the exemption were to be developed for large scale solar.
  - If there were a continued agricultural use on this property, such as the use of sheep to manage the grass/weed growth, the roll back conversion penalty would not apply.

- Land that is converted to a large scale solar development would lose the agricultural exemption on future assessment rolls.
  - However, if the land were to continue in agricultural use, such as the use of sheep to manage the grass/weed growth, the exemption could still be applied for any if the operation meets the other requirements of the exemption, an agricultural exemption could be granted on the land itself.

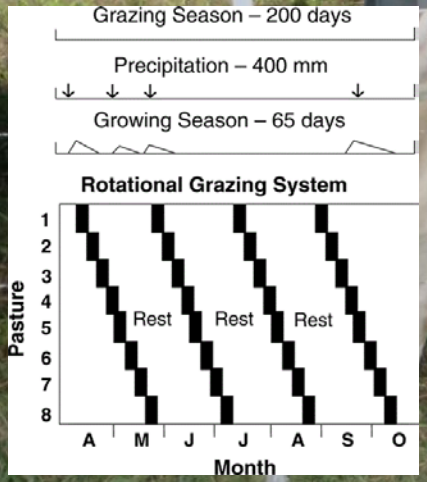
Mail Address:
128 East Buffalo Street
Ithaca, New York 14850
http://www.tompkins-co.org/assessment/

Tel: 607-274-5517
Fax: 607-274-5507
assessment@tompkins-co.org

Nori makes it easy for farmers to get paid for storing carbon in soil.

Grazing Sheep on Solar Array Sites to Boost Pollinator Habitat and Sequester Soil Carbon

https://solargrazing.org/grazing-sheep-pollinators-carbon/



Amazing Carbon, Dr Christine Jones

https://www.amazingcarbon.com/

Questions & Answers

ASGA

www.solargrazing.org