

## **Pasture Management for Severe Weather and Climate Change**

### **Climate and Weather Resources:**

**Soil Water Deficit Calculator and Drought Monitor**, <http://climatesmartfarming.org/>

**Climate Prediction Center**, <https://www.cpc.ncep.noaa.gov/>

**Hourly Weather** - The National Weather Service has a website that provides the weather data you need to know for farming activities. For example, of the four weather elements that affect hay drying - sunshine, temperature, wind, and humidity – the two most important are wind and humidity. A four-day forecast for these weather elements and several others can be found by going to <https://www.weather.gov/aly/>. Enter your zip code in the upper right, where it says, “Local forecast by “City, St” or Zip code”. Click “Go”. On the next page scroll to the bottom and select “Hourly Weather Forecast”. Now you can see the forecast for not only rain and temperature, but humidity, wind, rain amount, and more.

### **Carbon Sequestration in Pastures (simplified):**

- The more carbon fixed by plants and contributed to the soil, the more carbon will be sequestered. The less soil carbon mineralized to CO<sub>2</sub>, the less greenhouse gases produced. On the animal end, the less methane released, the less greenhouse gases from the system.
- A healthy productive pasture with deep roots and healthy soil will promote carbon sequestration. Increases in soil carbon take time and patience. It is a tricky thing to measure. Practices to foster sequestration include: species diversity; deep roots (letting plants grow to maturity periodically); high productivity (without too much nitrogen fertilizer); managing livestock to have healthy productive pasture.
- To reduce methane for livestock, balancing high protein pasture with carbohydrates improves animal productivity and shifts the rumen microbial community (the bacteria that help digest fiber also produce methane). Feeding unsaturated fats and using ionophore antibiotics help reduce methane production. Less conclusive is feeding organic acids (like malate, fumarate, acrylate) or seaweed.

### **Pasture Management through Flood and Drought:**

#### **Basic Soil Health with an Emphasis on Water Infiltration**

- Soil erosion begins when water infiltration stops.
- Chemical / Physical / Biological aspects of soil health
- Deep roots, soil surface cover, vigorous growth, minimal soil disturbance, compaction relief, feeding the soil organic matter
- For deep roots – frost seed/inter-seed red clover; plant tap-rooted forbs (chicory). For established pasture, perhaps plant into herbicide-killed strips so that plants can establish without competition

**Subsurface Drainage:**

[\(https://blogs.cornell.edu/capitalareaagandhortprogram/2014/12/02/tile-drainage/\)](https://blogs.cornell.edu/capitalareaagandhortprogram/2014/12/02/tile-drainage/):

- Subsurface (Tile) drain removes excess water in soil and lowers the water table. This makes soils more productive and can allow traffic earlier in the spring and later in the fall. The proportion of nitrate loss increases in tile drainage water compared to surface runoff. The opposite is true for phosphorus loss.

**Surface Water Management (NRCS has engineering expertise to plan a project):**

*Field Ditches – collect and move water away to an outlet*

- Calculate area to be drained and ditch size, shape, slope, etc
- Outlets must be stable and carry water away and not create a new problem
- Balance water infiltration and runoff
- System Maintenance – siltation, vegetation management, storm damage, etc.

*Diversions – break up concentrated flows, change direction of water, disperse water runoff, slow down runoff*

- Use berms, rocks, half-buried logs, plantings of trees/shrubs at a shallow grade. Place singly or in a pattern to slow and spread out the flow of water.
  - Slowing water speed will increase infiltration and facilitate drought resiliency and reduce erosion
  - Trials with the Yoeman plow have not improved water infiltration in our humid climate, like it does in dry climates
  - Zonebuilders which cut slots in plow pans have improved water drainage in our region (wet spots have gone away).
- Diversions at a gentle slope (grade) to a conveyance or to a series of conveyances and/or basins to hold water during “high-flow” events.
- Consider where water will end up, so as not to create a different problem
- Do not reduce water flow so that natural wetlands dry up
- Plant species adapted to the critical areas – reed canarygrass in wet areas; - (endophyte-free) tall fescue in high traffic areas
- Establish filter areas where water can flow and be cleaned before entering waterways

## Managing Severe Weed Infestations in Pastures

### **Prevention:**

- Know the source and weed seed status of imported hay, silage, grains, compost and any other imported material – visit the source farm
- Do not spread seeds – do not let livestock, people, or machines move weed seeds around the farm. Stay out of weed patches when they are in seed.
- Pay attention to flooded areas
- Eradicate infestations of problem weeds early
- DO NOT LET WEEDS GO TO SEED. Often you can significantly reduce the seedbank in three to six years for many weeds.

### **Learn the Biology of the Specific Weed:**

- Summer or Winter Annual / Biennial / Perennial
- Seasonality of growth – cool-season, warm-season
- How does it reproduce – seeds, rhizomes (spreading roots), stolons (spreading stems)
- How is energy stored in perennials – roots, stem base, stolons,
- Where are the growing points – along stolons or rhizomes, in crown above ground or below soil surface
- Should seeds be left on the soil surface for seed predators and decomposition or buried deep?
- Adaptations to soil drainage, shade, plant competition, pH, compaction, etc

### **Herbicides:**

- Apply to annuals and biennials when they are small (<4")
- Apply to perennials when they are actively growing and have sufficient foliage to take up substantial herbicide, usually up to the bud stage. Late summer can also be a good application time for some perennials.
- For tough perennials, you may have to make two herbicide applications per year and maybe for more than one year
- Glyphosate works best in the fall.
- Once the weeds are dead, grow desirable forage to fill the void

### **Control Methods:**

- *Possibly mob grazing* and bale grazing to disturb the area, trample and smother weeds, create a different environment, and provide new seed to replace the weeds
- *Teach livestock to eat the weeds*, if they are not poisonous. Balance weeds with other forage
- *Crop rotation for a year or two* – kill plants with herbicide or tillage, then rotate to aggressive winter annuals (triticale + legume, etc), spring annuals (annual ryegrass, crimson clover, red clover, etc), summer annuals (sorghum- sudan, cow peas, buckwheat, etc)

### Clipping Weeds:

- Consider if a rotary mower (brush hog) or sickle bar is best. It is easy to use a sickle bar to clip seedheads
- Clip at 4 inches high so that grasses are stimulated and not set back.
- Be sure fertility is high so that desired forages can re-grow quickly. Grasses especially need nitrogen (25 - 50 lbs/ac) and legumes especially need phosphorus and potassium (based on a soil test).
  - **Annuals** – do not let them go to seed. Annuals do not want to die until they have produced seed. They will send up seedheads after each mowing, three or more times. Keep clipping.
  - **Biennials** – do not let them go to seed. They send up their seedhead in year two of their life cycle. Clip the flower heads before seed is set. Subsequent clippings will be needed. For individual plants, use a shovel to cut off all the growing points by slicing the stem just below the soil surface. It will not re-grow.
  - **Perennials** – Energy reserves are lowest at flowering. You can start earlier, but clip plants at flowering and keep clipping every time they put on two to four leaves. Do not let them replenish the roots. ***Kick (clip) them when they are down (low energy reserves) and then keep kicking (clipping).*** I have eliminated *milkweed* by clipping it eight times during one year. It did not re-grow the next year. This year, I started clipping a patch of a few dozen milkweed shoots after flowering. So far it has been clipped 4X from mid August to Oct 3<sup>rd</sup>, 2021, and only a 5 or 6 small shoots were present on Oct 3<sup>rd</sup>. *Brown knapweed* was also reduced with fertility and 3 clippings/year.

### Specific Weeds:

#### **Knapweeds** (short-lived perennial)

- slightly allelopathic; seeds stick to animals & things;
- a fly & weevil in our area feed on seedheads and seeds, but not sufficient for control; knapweed is palatable when young and livestock can be trained to eat it (sheep may graze the rosettes of leaves better than cattle); intensive management (high fertility and mowing 3X/yr) will reduce this weed; dicamba + 2,4-D (Banvel) herbicide in August has been effective, also triclopyr and is supposed to be effective, but read label for restrictions (residue carries over in cow feces and urine which will harm broadleaves).

#### **Ground Ivy** (*a tough perennial weed to control*)

- adapted to many soils that have good moisture; grows in shade and full-sun; spreads by stolons and seed; tolerates soil compaction
- Banvel (dicamba + 2,4-D) and Crossbow (triclopyr + 2,4-D) are effective post-emergent herbicides. Should be applied in spring and late-summer/fall. The one pre-emergent herbicide that reduces stolon rooting (isoaxaben) is not registered in NY. *Plant shade tolerant grasses (orchardgrass) and fertilizer with nitrogen to outcompete the ground ivy.*

#### **Smartweed** (annual)

- Like moist areas of many soil types. In a wet year like 2021, they were establishing in wet areas where livestock had trampled and disturbed the soil.
- Dry out wet areas, mow to prevent weed seed and to kill the plant; re-plant areas if not enough desirable forage is growing.

### **Mugwort** (*perennial*)

- Rhizomatous, allelopathic, adapted to moist soils, very aggressive. Multiplies mainly by rhizomes but also seeds. Not listed as poisonous but has several medicinal properties. Probably consuming large amounts could be bad.
- Glyphosate is effective (may need more than one application) where solid stands are established. A special 2ee registration is available for Milestone herbicide (can only be used for mugwort). Can be used where forage grasses are mixed with mugwort. Grasses will not be harmed by Milestone. Cattle feces will have herbicide residue and will kill broadleaf plants. Rotate to annual crops with mowing and tillage to kill and reduce rhizome vigor, if herbicides are not used.

### **Yellow Foxtail** (*annual*)

- Seeds can cause physical harm when eaten, forage is edible but probably not as palatable as forage species; seeds mature only two weeks after flowering; seeds survive only three years or so if not buried deep; high/low daily temperature variation promotes germination; tolerates poor drainage; not shade tolerant;
- Clip and do not let it produce seed; A healthy & vigorous pasture with several grazings/clippings should reduce and eliminate yellow foxtail; Prowl herbicide applied before germination can reduce foxtails and other germinating grasses and some broadleaf weeds.

### **Smooth Bedstraw** (*perennial*)

- Tolerates low pH and low fertility better than desirable forages (but can compete in high fertility conditions as well); large underground root to store energy; seeds survive only one year; edible and nutritious
- Crossbow is the preferred herbicide; teach cattle to eat bedstraw; bring up pH and fertility; do not graze or clip too short as to set back forages
- *Two year process*: clip it so that it does not go to seed the in year 1. In year 2, apply Crossbow in the spring before flowering to kill established plants. No new seeds should germinate. Only one application per year of Crossbow is allowed. A different herbicide may be needed in late summer (or before flowering) if a second herbicide application is needed.

### Milkweed Persistence After Mowing

Aaron Gabriel

I wanted to see if milkweed mowing (or pulling by hand) would kill milkweed. In 2018, my son and I hand pulled milkweed in a one-acre area of a hay field. There was a large patch (30' X 60') and a smaller patch (40' X 20') of milkweed. We counted the plants and pulled or mowed the field early in the season. Then two more cuttings of hay were taken in August and September. Milkweed plant numbers decreased greatly by the end of the summer.

In 2019, I found only about 6 plants in the spring, which I pulled up (in June). I took three cuttings of hay through the 2019 season and did not see any milkweed after the first cutting (July 1, 2019). **I think the key is to cut the plants when they are young and only have a few leaves.**

In an adjacent pasture, there were a couple of patches of milk weed. I did not count plants, but starting in August 2018, I pulled up the plants and did it again in September 2018. In 2019, the population was greatly decreased but not totally eliminated. I think a little more aggressiveness (started pulling the plants earlier) could have eliminated these patches as well.

Date	Plant Height	Growth Stage	# of plants
6/25/18	2.65 ft	5-lf to flower	161
6/25/18	Mowed to 3" stubble		
7/5/18	0.75 ft	Vegetative	173
7/5/18	All plants pulled by hand		
8/4/18	1.3 ft	Vegetative	132 (multiple shoots per stem)
8/15/18	Mowed, no count taken		
9/2/18	Regrowth about 4 leaves		
9/3/18	Mowed, no count taken		
9/16/18			6
9/16/18	Plants pulled by hand		
2019	About 6 plants grew in the spring. Three hay cuttings taken and no plants remained at the end of the summer.		

### **Effects of Mowing and Fertility on Brown Knapweed in Orchardgrass**

– study by Aaron Gabriel

#### **Observations:**

- Mowing four times per year and higher fertility both help orchardgrass outcompete brown knapweed the best.
- The orchardgrass was most dense in the plot cut at 2" and 4 times per year (although 2" cutting height is not recommended).
- The knapweed never died out completely, but its population did decrease.
- A similar study should be conducted with a sod-type grass (Kentucky bluegrass, reed canarygrass).