Proceedings of the 2015 Northeast Pasture Consortium Annual Conference & Meeting held at the Waterfront Place Hotel & Conference Center in Morgantown, WV, March 11-12

Findings of the literature review of riparian grazing effects on water quality

After Jim Cropper, Executive Director, welcomed all the attendees at the opening session and gave them a brief overview of what was to take place over the two-day conference, a round-the-table self-introduction by each of the attendees was given. Our first session, **Findings of the literature review of riparian grazing effects on water quality**, was opened by Dr. Peter Kleinman, Research Leader of the ARS Pasture Systems and Watershed Management Research Unit (PSWMRU) at University Park, PA. They have set up a Riparian Conservation Team within their research unit and with the Pennsylvania State University Riparia Center Director, Dr. Robert Brooks. They also have a graduate student from Washington State, Ms. Joy Drohan, to act as a publicist to keep everyone informed on the outcomes of their research and progress on building a tool to aid conservation agencies and farmers in evaluating the effects of grazing different types of riparian areas and type of grazing management employed. Dr. Kleinman projected that the Riparian Conservation Planning Tool would be a 4-year project. Two years will be needed initially to develop the tool. A third year would be required to build the tool. A fourth year will be used to introduce the tool to everyone interested in managing riparian pastures. He said there are trade-offs on issues of grazing riparian areas. There are many different issues that need to be explored. Riparian areas vary much in their sensitivity to grazing as stream size, its sinuosity, water depth, grade, armoring, streambank height above the water and its erosivity, vegetative cover, nature and distribution of hydrologically active zones along their course, and other physical properties that make each riparian area somewhat unique from others depending on what watershed they reside in or within a single watershed. A study done in the New York City Cannonsville Watershed on some pastured riparian areas showed that the cattle spend 12-13 percent of their daylight time in near-stream areas and 6 percent of their time in-stream. Twelve percent of the agricultural loading of phosphorus came from in-stream fecal loading. However, it should be noted that some of these pasture areas in the study were more like loafing areas and often had stored feed feeding stations near the stream. This would heighten the activity of cattle near the stream. Other pastures where cattle must rely on most of their intake from the pasture forage itself would tend to spend less time in or near any stream running through those pastures depending on whether the stream is their sole source of water or if they can drink water from a stock tank or trough set well away from the stream. An exception would be in pastures that are narrowly linear along a stream. The livestock are fenced-in in close proximity to the stream so they have no choice but to be close to the stream. Rotationally grazed pastures also would have less access to the stream for long periods of time as well or no access except at a constructed stream crossing if a temporary paddock fence or an electrified single-strand permanent fence prohibited access to the stream when a stream-side paddock was occupied by grazing livestock.

Dr. Kleinman pointed to some research findings from the Stroud Water Research Center in PA. They find that streams in wooded areas are wider and have more biological activity. However, researchers in Minnesota feel that wider is not better from a fishery standpoint (Sovell et al). "Fish species richness did not appear to be related to differences in grazing practices. However, fish density and abundance were related to riparian condition on stream 3, where substantially fewer fish were found at the wood-buffer site during both years. The extremely low density of fish may be related to the limited amount of suitable habitat available at the wood-buffer site (high width-to-depth ratio, percentage of fines, and embeddedness), and/or to reduced sampling efficiency." Narrow streams occur in grassy areas.

Streams are good in processing nitrogen, but do not process phosphorus well, carrying it mostly unprocessed to estuaries or reservoirs.

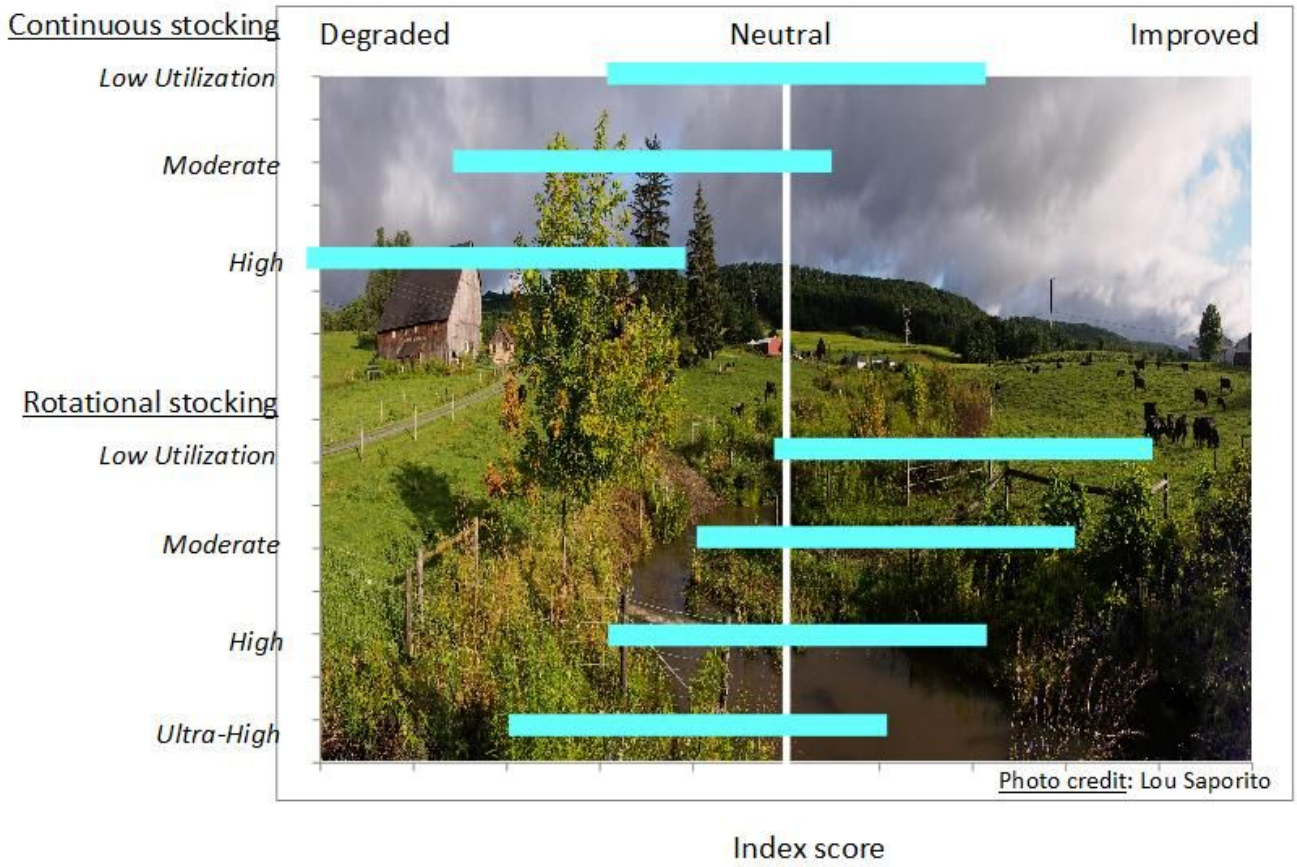
He wrapped up his presentation acknowledging that riparian pastures do provide valuable source of forage to grazing livestock. To totally forgo the use of this land for providing a forage resource is not a palatable choice to the landowner who may be land poor to begin with. Timely mechanical harvest of these forages may not be an option if the land is often wet, or physically difficult to harvest if broken into isolated patches by side channels, gullies, and oxbows.

Dr. Howard Skinner from PSWMRU was the second speaker for this session. His presentation was *Riparian Grazing Management*. He started out with the question, "Why Graze Riparian Zones?" He listed several reasons. (1) Utilize all forage/acreage on the farm. (2) Utilize forage when other pastures are dormant (i.e. drought). (3) Provide shade for livestock. (4) Provide water in areas remote to well water. (5) Biological weed control (Some fenced-off riparian areas have issues with invasive plant growth). (6) Provide access to other parts of farm (i.e. stream crossing for livestock and machinery). The loss of productive land is a big issue with the farm landowner if the riparian zone ends up being a fenced-off corridor. In a farmer survey that was conducted recently, fencing was the biggest issue mentioned. It was also the biggest issue in chapter 3, Prescribed Grazing on Pasturelands, in the Pastureland Conservation Effects Assessment Program book, *Conservation Outcomes from Pastureland and Hayland Practices*. The second biggest issue was water distribution. Fencing is difficult and time-consuming if doing it yourself, and expensive, if hiring a fencing contractor. Fencing to keep livestock out of an area represents a high cost for something that will unutilized by the farm rather than making for more efficient utilization of that resource. The only time this would be worthwhile is if by fencing-off the riparian area, the livestock would be protected from harm either from drinking contaminated water or from injury or death by hazards within the stream or riparian zone. In this latter case, most farms will opt for the narrowest corridor possible to keep the loss of productive land to a minimum.

Dr. Skinner asked a second question, "What grazing tools are available for stream-side/riparian areas?" He enumerated these responses:

- Flash / rotational grazing
- Timing of grazing
- Off-site shade (portable preferred)
- Off-site watering (portable preferred)
- Temporary fencing
- Stream crossing (hardened in some fashion, preferably at a riffle area if one exists)
- Silvopasture establishment

In a series of slides, he showed that short duration rotational grazing (stocking) is better at protecting riparian areas and their streams than continuous grazing (stocking). Stocking rate is a big issue regardless of stocking method used. However, a much higher degree of stocking density and forage allocation can be done using short duration rotational stocking than can be done using continuous stocking. As soon as the livestock have consumed the forage in a paddock down to a reasonable amount of residual forage mass left to foster quick regrowth recovery, the livestock are moved to another paddock. This option is rarely available in a continuous stocked pasture unless there are other pastures left in reserve (rarely if ever), or fields cut for hay have regrowth ready for grazing and this can be diverted to pasture instead of making more hay and not leave the farmer short of stored forage.



Rotational stocking even at ultra-high forage utilization is less harmful to water quality and streambank stability than continuous stocking since livestock occupancy is never 100% of the time on entire pasture as with continuous stocking. Less in-stream treading, fouling, and grazing can occur.

Importantly, complete livestock exclusion from portions of pasturelands, such as riparian areas, may not be the best solution for the ecosystem. Some level of vegetation disturbance is likely needed to maintain or improve biodiversity on pasturelands.

The greatest knowledge gaps with respect to water quality from pastures and hayland involve comparative efficacies of best management practices and their cost-effectiveness. Does an exclusionary fence's cost return at least the same dollar amount in reducing nitrogen, phosphorus, and sediment delivery to the stream and downstream waters? Do we even know the economic impact of reducing nitrogen, phosphorus, and sediment to a targeted water body in real dollars?

Dr. Ed Rayburn noted that he lost woodcock when he put in an ungrazed stream buffer. He attributed it to forming a habitat that was unsuitable to woodcock. If he had known that, he would not have done the practice. Dr. Geoff Brink also noted that phosphorus can be released by unfertilized bermudagrass. If it is not harvested, as in a grass buffer along a stream, we may actually do little to reduce phosphorus loading to a stream. Mr. Richard Swartzentruber also said that he heard that phosphorus leached from

weathered vegetation is similar to direct deposit of dung and urine into water.

Dr. Skinner also illustrated what ecosystem services riparian area pasture perform. The first one was provisioning services. A riparian pasture provides forage, water, shade, weed control, incentive based income to the farmer, manure spreading (grazing animals themselves spread dung and urine themselves seasonally; giving the farmer more time to do cropping system work during the growing season), and often access to other parts of the farm if it is divided by a stream.

The second set of ecosystem services was regulating services. This provides water flows, flood storage and desynchronization effects, erosion control (retain soil and sediment), soil health and climate regulation as a source and sink for carbon, and nutrient mitigation (retain, remove (principally nitrate), and transform (nitrate to gaseous nitrogen). Grazing animals can adversely affect water flows by creating concentrated flow paths when they create bare animal paths on sloping ground, compact the soil surface with their hooves producing more runoff, and destabilize streambanks at crossing areas or on banks they attempt to graze more intensely if overstocked.

The third set of ecosystem services was supporting services that revolved around biodiversity issues: Biodiversity of fish and macroinvertebrates in the water, terrestrial and aquatic plants, birds, pollinators/insects, and mammals, reptiles, and amphibians.