landscaping perennial fruits

PLACEMENT OF PERENNIAL FRUITS ON THE LANDSCAPE FOR ECOSYSTEM SERVICES

INTRODUCTION

Woody perennials can provide ecosystem benefits. Soil and agricultural nutrients and chemicals cause water quality issues when surface runoff reaches water bodies, streams, and wellheads. Groundwater quality can also be compromised when nutrients and chemicals leaching through the soil profile reach groundwater; or in areas where the geology allows surface runoff to reach groundwater, such as karst sinkholes (see Agriculture and Water Quality sidebar, p. 101). When perennials are strategically placed on the agricultural landscape, sediment and nutrient loss from surface runoff can be greatly reduced. Iowa State University Extension's publication *A Targeted Conservation Approach for Improving Environmental Quality* suggests that agroforestry niche crops such as perennial fruits can be integrated into cropping systems as a means to improve water, air, and soil quality while providing habitat for pollinators, wildlife, and predatory insects that serve as biological control of pests.[66]

Some additional farm-level benefits that can be gained by the thoughtful placement of woody perennials include resilience in flood, living snow

[66] Schulte, Lisa A., et al. *A Targeted Conservation Approach for Improving Environmental Quality.* Iowa State University. 2008. Web. 06 March 2017. https://www.nrem.iastate.edu/research/STRIPs/files/page/files/A%20Targeted%20COnservation%20Approach%20for%20Improving%20Environmental%20Quality.pdf

fences, and mitigation of issues like wind stress to crops or livestock. Iowa organic farmer, Tom Frantzen, experienced first-hand the effectiveness of woody perennials in an agroforestry planting. During the flooding of his farm in 2008, the 66' wide shelterbelt surrounding his fields slowed down rushing floodwater, thereby allowing it to deposit sediment on the fields rather than carry topsoil and nutrients away.[67]

When woody perennial fruit crops such as elderberries or currants are placed strategically to attain ecosystem benefits, there is an added bonus of a harvestable crop. The fruit crop can be used on-farm or sold in a niche market. There is income potential from value added products, fruit sales directly to consumers or to processing facilities. Several emerging fruit crops are gaining interest due to nutritional content and health benefit claims. Woody perennial fruits that sell in niche markets can be a great way to diversify the farm enterprise while addressing environmental concerns. The University of Missouri Center for Agroforestry discusses the market opportunities for agroforestry species in their comprehensive *Training Manual for Applied Agroforestry Practices (chapter 5)*.[68]

When considering perennial fruit crops for dual purposes of ecosystem benefits and a saleable crop, keep in mind that perennial fruits require intensive management in order to produce a harvestable, profitable crop. A typical conservation planting of perennials may be managed in the early years to control weeds and ensure establishment of the perennials, but little management after that other than mowing or spot spraying for weed control. Fruit crops, on the other hand, typically require ongoing management such as pruning, nutrient and pesticide application, protection from foraging animals including birds, and weed management to achieve a harvestable crop. Management of a perennial fruit planting for both ecosystem benefits and a harvestable crop will be quite different from management of a typical conservation planting.

PLANTING SITE FACTORS

When selecting a fruit crop for a site, match the species or cultivar to the conditions of the area where it will be grown. Fruit crops can be sensitive to site conditions just like most other horticultural or agricultural crops, and attention to the plants' requirements can mean the difference between crop failure and success.

[67] Grimsbo Jewett, Jane. "Tom and Irene Frantzen." Green Lands Blue Waters. July 2015. Web. 07 March 2017. http://greenlandsbluewaters.net/Tom_and_Irene_Frantzen_2015_022317.pdf

[68] Gold, Michael, Cernusca, Mihaela, & Hall, Michelle, Eds. "Chapter 5: Upland & Riparian Forest Buffers." *Training Manual for Applied Agroforestry Practices*. 2015 Edition. Center for Agroforestry, University of Missouri. 2015. Web. 07 March 2017. http://www.centerforagroforestry.org/pubs/training/chap5_2015.pdf

Table 15. Soil and other conditions for emerging fruit crops.

Crop	Sunlight	Preferred soil type	Preferred soil pH	Unique Features
Red Currants	Full sun to partial shade	Silty to clay loam	6.0-7.0	Prefers cool soil
Black Currants	Full sun to partial shade	Sandy to clay loam	6.0 – 7.0	Prefers cool soil
Clove Currants	Full sun	Sandy loam to clay	6.0 – 7.5	Heat tolerant
Gooseberries	Full sun to partial shade	Sandy loam	6.0 – 7.5	Prefers cool soil
Aronia	Full sun	Sandy to clay loam	5.0-7.0	Tolerates acidic soil
Saskatoon*	Full sun	Silty and clay loam	6.5- 8.0	Tolerates high pH
Juneberry	Partial shade	Sandy to clay loam	5.5 -7.0	
Elderberries	Full sun	Silty loam to clay	6.0-7.5	Can survive poorly drained soil
Honeyberries	Full sun to partial shade	Sandy to clay loam	6.0 – 7.5	Frost tolerant flowers
Chokecherries	Full sun	Sandy to clay loam	6.5-8.0	
Nanking cherries	Full sun	Sandy loam to sand	6.5-7.5	Drought tolerant
Sand cherries	Full sun	Sandy loam to sand	6.5-7.5	Drought tolerant
Wild Plums	Full sun	Sandy loam	6.5-7.5	Spreads through root suckers
Actinidia (Hardy Kiwi)	Full sun- A. arguta Partial shade - A. kolomitka	Sandy to silt loam	5.0-6.5	Needs trellising
Goji Berries	Full sun	Sandy loam	6.0-7.5	
Seaberries	Full sun	Sandy to Clay loam	6.5-8.5	Nitrogen fixing
Buffalo Berries	Full sun	Clay loam	7.0-8.5	Tolerates alkaline soil
Autumn Olive	Full sun	Silty to clay loam	5.0-8.0	Nitrogen fixing

*Saskatoon refers to a specific genotype of *Amelanchier alnifolia* which has different site requirements than eastern juneberries.

RIPARIAN BUFFERS

Riparian buffers are a zone of vegetation along rivers and streams. Woody species have been recommended for use in sediment-slowing buffers as a means to improve water quality and wildlife habitat. In the publication Riparian Buffers for Wildlife from Penn State Extension[69], trees and shrubs are presented as important components of riparian buffers.

By slowing overland flow of water to rivers and streams, riparian buffers trap sediment and nutrients thereby improving water quality. In a statewide effort to enhance water quality, Minnesota's Buffer Law requires riparian buffers on all public waters and drainage systems.[70] The law requires at least 75% of the vegetation within the buffer must be perennial. The law does not restrict harvest and sale of crops from those buffer areas so long as perennial vegetation is maintained. Planting woody perennial fruits in these buffer zones can satisfy part of the 75% perennial requirements and provide a harvestable, income-generating crop from these acres.

Additional benefits of installing buffers include groundwater recharge and improved fish habitat. One need not be motivated solely by a legal mandate to address runoff issues and provide an income-generating crop.[71]

Agriculture and Water Quality

Annual agricultural crops tend to allow runoff of soil, chemicals, and nutrients into adjacent water bodies. This is due in part to the smaller root systems of annual plants in comparison to perennial plants, and because annual cropping systems tend to leave the ground with no living roots or living cover on it, for several months out of the year.

The consequences are water quality issues. One striking example is the hypoxic zone in the Gulf of Mexico. Nicknamed the "Dead Zone," agricultural runoff along the Mississippi River leads to areas of the Gulf where fish and other aquatic organisms cannot live.

Another example is groundwater with high levels of nitrogen contamination in heavily row-cropped areas. Nitrogen can become a pollutant in local drinking water when there are no substantial root systems in place to take up the excess. High levels of nitrogen can be a health concern and as a result, treatment of water can be an expense for municipalities.

When the Minnesota Pollution Control Agency assessed Minnesota's waters, 40% of the waters were deemed impaired. This means that pollution by chemicals, bacteria, particulates, etc. were high enough to render the water quality unsuitable for "beneficial uses" such as swimming or drinking.

http://www.gulfhypoxia.net/Overview/
http://www.health.state.mn.us/divs/eh/wells/waterquality/nitrate.html
https://www.pca.state.mn.us/water/minnesotas-impaired-waters-list

[69] DeCecco, Jennifer A. and Brittingham, Margaret C. *Riparian Buffers for Wildlife*. PennState Extension. N.d. Web. 06 March 2017. http://extension.psu.edu/natural-resources/wildlife/habitat-management/pa-wildlife-16-riparian-buffers-for-wildlife

[70] State of Minnesota. 2015. Water Quality Buffer Initiative. Fact Sheet. State of Minnesota. Web. 07 March 2017. http://mn.gov/gov-stat/images/2015_buffers_fact_sheet.pdf

[71] DeCecco, Jennifer A. and Brittingham, Margaret C. ibid

WINDBREAKS

A windbreak is a structure, natural or human-made, that slows wind velocity. The use of woody fruit species in a strategically placed windbreak can provide income with the added benefits of protecting row crops or livestock, preventing wind erosion, evenly dispersing snow across cropland, improving air quality, or improving energy efficiency in buildings. More information about strategic planting of perennials in windbreaks and shelterbelts can be found in the University of Minnesota Extension publication, *Discovering Profits in Unlikely Places: Agroforestry Opportunities for Added Income*.[72]

Placement, density, and height are all important factors to consider when planning a windbreak. For example, windbreaks must be a minimum of 2.5 feet high to be effective. The area protected by the windbreak is proportional to the height of a windbreak. If a fruit species does not grow high enough to provide desired effects, consider taller species flanked by the shorter species. Detailed information on placement, density, and height can be found in chapter 6 of the University of Missouri Center for Agroforestry's *Training Manual for Applied Agroforestry Practices*.[73]

ALLEY CROPPING

Another opportunity for integrating fruit crops is a practice referred to as alley cropping. Wide rows of crops are alternated with rows of woody perennials such as high-value lumber species or fruit trees. When arranged in this manner, woody perennial rows serve as windbreaks and create a protected micro-climate for the shorter-term crop growing in the alleys. More details for how to integrate alley cropping on the landscape can be found in chapter 3 of the University of Missouri Center for Agroforestry's *Training Manual for Applied Agroforestry Practices*.[74]

[72] Josiah, Scott. 2000. *Discovering Profits in Unlikely Places: Agroforestry Opportunities for Added Income. University of Minnesota Extension*. Web. 14 June 2017. http://www.extension.umn.edu/environment/agroforestry/discovering-profits-in-unlikely-places/

[73] Gold, Michael, Cernusca, Mihaela, & Hall, Michelle, Eds. "Chapter 6: Windbreaks." *Training Manual for Applied Agroforestry Practices*. 2015 Edition. Center for Agroforestry, University of Missouri. 2015. Web. 07 March 2017. http://www.centerforagroforestry.org/pubs/training/chap6_2015.pdf

[74] Gold, Michael, Cernusca, Mihaela, & Hall, Michelle, Eds. "Chapter 3: Alley Cropping." *Training Manual for Applied Agroforestry Practices*. 2015 Edition. Center for Agroforestry, University of Missouri. 2015. Web. 07 March 2017. http://www.centerforagroforestry.org/pubs/training/chap3_2015.pdf