

Summary of Session 12, Riparian system effects on soil and water quality

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This session focused on the effects of riparian systems on soil and water quality; here riparian systems are defined as parts of the landscape (assemblages of flora and fauna) that are used in agricultural management for reducing non-point source pollution. Six out of the eight scheduled presentations were made; one of the two absent presenters noticed the organizers of the session that he/she was not coming due to funding issues while the other never showed up or let the session organizers know that he/she was not coming. The session was very well attended with about 40 people in the room for the majority of the session.

Key messages/insights from the session:

I. From the first presentation by Dr. Minghua Zhang (University of California, Davis), on agricultural BMPs and their role in improving surface water quality

1) The number of peer reviewed papers on BMPs increased from 1 paper a year in 1987 to 40 papers a year in 2006; 2) based on a review of the literature and meta-analysis of the data in the literature the removal efficacy of vegetative buffers was found to range from 68% for N to 86% for sediments; 3) the removal efficacy was strongly related to buffer width regardless of the pollutant concerned; and 4) the calculation indicated that when the slope of the riparian area is greater than 10%, the removal efficacy is negatively affected and optimal buffer width is 20 m.

II. From the second presentation by Dr. Klaas Broersma from Agriculture and Agri-Food Canada on vegetation, water quality and benthic invertebrates in response to cattle exclusion fencing.

1) Riparian exclusion fencing BMP was effective in reducing E. coli contamination and suspended sediments during times that cattle were present; 2) riparian fencing reduced bare soil and increased vegetative cover; 3) cattle grazing reduced grass and shrub vegetation, increased amount of bare soil and cattle tracks; and 4) the use of exclusion fencing as a BMP on cattle farms protects riparian habitat and enhances stream side vegetation and helps improve stream and fish habitat for the Salmon River watershed in British Columbia.

III. From the third presentation by Dr. Armand Natta of the University of Parakou in Benin on rehabilitation of degraded riparian forests and watersheds based on useful trees: issues and lessons.

1) Riparian forests in Benin are under severe threats mainly caused by anthropogenic disturbance and climatic vulnerability; 2) in Benin, no farming or logging are allowed within a 25 m strip on both sides of any waterway; and 3) strategies for biodiversity conservation and sustainable management of riparian forests within landscapes had positive effects.

IV. From the fourth presentation by Dr. Scott Chang of the University of Alberta on the functionality of riparian systems as a potential sink or source of N and P.

1) Recent work on nitrate removal from riparian systems has emphasized the potential of denitrification on greenhouse gas emissions. Nitrous oxide emission from riparian systems can be as high as 200 kg N ha⁻¹ year⁻¹ where external rate of input of N is high; 2) an Albertan study found that when N input into riparian areas being farmed is high, the rate of denitrification rate was high and it was higher than in riparian areas under native vegetation; and 3) there has been increased recognition that hydrological pathways are important in understanding the effectiveness of riparian systems in removing N and P out of the ground/surface water.

V. From the fifth presentation by Dr. Farah Yousif Suliman on Taungya system in the Blue Nile Riverine Forests - Case study Gazair forest, Sennar state / Sudan.

1) Depending on the crop grown in the Taungya system, growth of trees can be significantly affected and the productivity of the agricultural crop is also very different; and 2) a priority in selection of farmers for Taungya should be given to poor and landless farmers and the use of the land should be free of charge.

VI. From the sixth presentation by Dr. Dan Moriasi (daniel.moriasi@ars.usda.gov) of the USDA Forest Service. The title of the presentation was: Sediment measurement and transport modeling: impact of converting cropland to forested stream buffers on soil loss and water quality at the watershed scale.

1) Applying a 10 m buffer strip on all cropped fields resulted in a 70% reduction in average sub-basin sediment yield in the Cobb Creek sub-watershed; 2) buffer strip practice had a greater impact on the reaches at the headwaters while the most stable rapid geomorphic assessment parameter values had a greater impact on the lower reaches; and 3) the combined stable channel parameters and 10 m buffer strip resulted in a 70% reduction in suspended sediment concentration at the sub-watershed outlet.

Action points for policy, research and extension or education

- 1) Long-term on-farm research is lacking in evaluating the impact of riparian systems on soil and water quality
- 2) The optimal riparian width was identified in several presentations as an area needing more research
- 3) Potentials for riparian systems to become a net source of pollutants such as N and P should not be overlooked, as riparian areas can become saturated with those nutrients after receiving external inputs for a long period of time
- 4) The issue of large spatial and temporal variations of processes in and properties of riparian systems was recognized and more meta-analysis of existing data should yield better understanding and modeling approaches will be useful to deal with the large number of variables involved in affecting the effectiveness of riparian systems in removing nutrients in surface water and groundwater.
- 5) Sampling designs for more robust statistical analyses are needed to properly assess the effects of riparian systems on soil and water quality.