Nova Scotia Agricultural College

Soil & Crop Improvement Association of Nova Scotia

fact sheet

Nutrient Distribution

Consider this: A producer walking through his pastures makes the observation that more grass seems to grow near his water tub compared to the rest of his pasture. He considers this and wonders whether this might be because the livestock congregate near the water tub and deposit more nutrients there. He also wonders whether it would be worthwhile to move the water tub around the pasture to promote more even nutrient distribution and forage growth.

Nutrient cycling in a pasture

Nutrient cycling in a pasture differs from that in non-grazed cropland because of the grazing animals. In addition to the typical nutrient cycling that occurs in the soil, nutrients are taken up by grazing animals in the forage they consume and are returned in urine and manure. However, the returned nutrients are not evenly distributed across the pasture.

Grazing animals congregate in certain areas, around water sources, near supplemental feed troughs, and in shaded areas. With this behaviour, nutrients are depleted from grazing areas and transferred to congregation areas, causing the distribution of fertility across the pasture to become uneven. Examples in the literature show that soil potassium, phosphorous, and nitrogen levels in a pasture are highest within 10-20 m, even up to 30 m, of a water tub, supplemental feed trough, or shaded area.

Congregation areas are also potential sites of nutrient loss to the environment. The nutrient levels in these areas exceed what can be taken up and used by the forage. This is particularly notable for nitrogen. A large proportion of the nitrogen returned is in urine, in a form that can easily be leached or lost to the atmosphere.

Promoting the even distribution of nutrients across a pasture may help improve pasture productivity and reduce nutrient losses to the environment.

To explore the producer's observations about nutrient distribution, projects were conducted on three pastures in Nova Scotia. The pastures were soil sampled to demonstrate the pattern of nutrient distribution and to explore the influence of water source location on nutrient distribution.

Sampling results

The pattern of nutrient distribution was influenced by the location of the water source in all three pastures (Figs. 1-4). Generally, the nutrient levels were high near the water compared to the rest of the pasture, then decreased with distance away from the water. Nutrient levels were generally highest within 5-18 m of the water source, depending on the nutrient and the pasture.

The Site A and B pastures belong to the producer who noticed a difference in grass growth. He reported that more growth occurred in the third of the pasture closest to the water source. Based on the pattern of nutrient distribution for these sites, it is reasonable to believe that the increased growth is the result of higher nutrient levels in the area, as well as decreased grazing of the urine and manure affected forage. For these sites, the largest nutrient gradients occurred for NH_4-N (ammonium-N) and NO_3-N (nitrate-N), so it is reasonable to believe that more available nitrogen in the area contributed to the increased growth.

The nutrient levels around the water tub were lower than expected at any of the sites, so it is difficult to

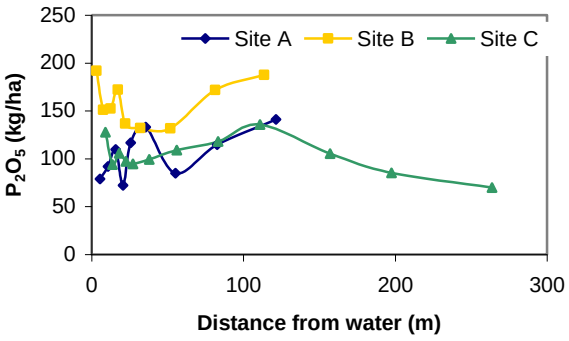

Figure 1: Soil phosphorous levels at distances from the water

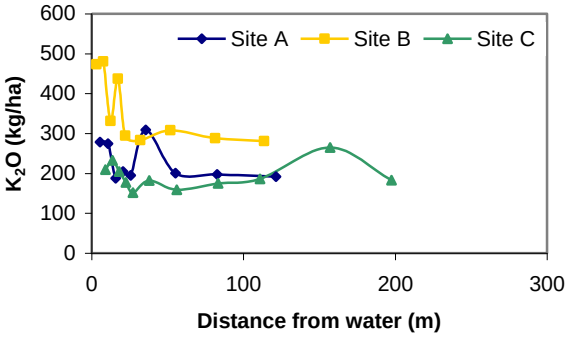

Figure 2: Soil potassium levels at distances from the water

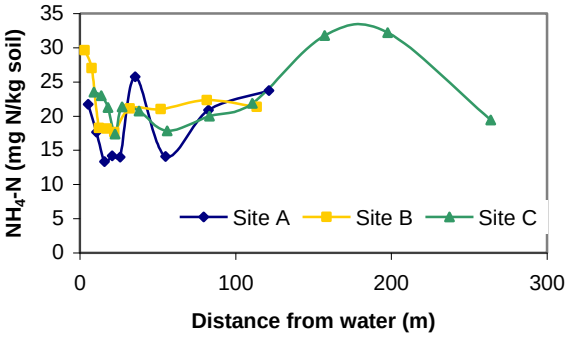

Figure 3: Soil nitrate-N levels at distances from the water

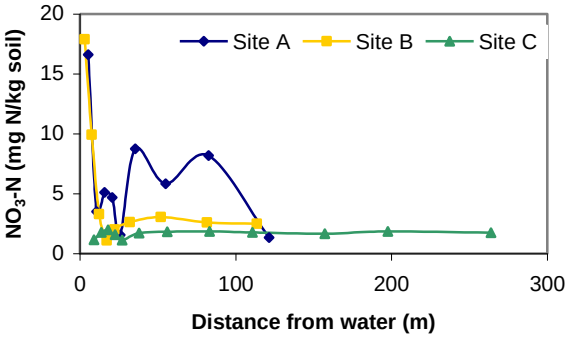

Figure 4: Soil ammonium-N levels at distances from the water

determine whether moving the tubs would be worthwhile. The size of the area with higher nutrient levels compared to size of the pasture overall should be considered, as well as how much higher the nutrient levels actually are.

Figures 1to 4 also show peaks in the nutrient levels further from the water, and sometimes as high, or higher, than the peaks observed near the water. These likely represent other areas where livestock congregate. To promote even nutrient distribution, paddock design should discourage animal congregation. Awareness of congregation sites may help producers design paddocks that reduce the occurrence of areas of elevated nutrients. However, livestock congregation will not be avoided completely.

Relocating the water tub could improve nutrient distribution and forage growth, but grazing management through good paddock design will optimize pasture use and productivity. Consider the forage requirements of your herd, the forage available, and your grazing schedule (the number of days you want your herd to graze before you move them). When designing new paddocks, determine how many paddocks you need for your grazing schedule and determine what size they should be. Or, to optimize the use of existing paddocks, determine how many animals each paddock can support and how long your herd can stay in a paddock before moving to a new paddock. Optimizing the use of new or existing paddocks combined with rotational grazing with adequate rest time between grazing to allow regrowth will ensure healthy and productive pastures.

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