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Artikel: The impact of draining, burning and fertilizer treatments on the nutrient status of floating "Typha" mats in a freshwater marsh = Der Einfluss der Drainage, kontrolliertem Abbrennen und Düngung auf die Nährstoffverhältnisse in schwimmenden "Typha"-Beständen

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Kapitel: 1: Introduction

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1. INTRODUCTION

In cool, northern wetlands nutrients tend to be withdrawn from circulation through incorporation into organic matter and surface litter which accumulates because of slow decomposition in this type of climate (e.g. WEIN 1983). ROWE and SCOTTER (1973) called this process nutrient lock-up. WARD (1968) reported for wetland areas where water levels had been artificially stabilized that organic matter can accumulate to substantial depths in comparatively short periods of time that is 10 to 20 years. And WELLER (1975) found in a newly established cattail stand the formation of a 35 to 43 cm thick mat in as little as 3 years. Unless there is a continuous supply of nutrients, the lock-up process must lead to a decrease in available minerals. WHITMAN (1974, 1976) observed this process in water level stabilized marshes similar to the one studied in the present paper, where in a relatively short period of time after impounding and flooding the amount of available nutrients declined. As was shown by BEAUCHAMP and KEREKES (1980), newly flooded impoundments tend initially to be limited by nitrogen and later on by phosphorus.
In areas where in more or less regular intervals drought periods occur, freshwater marshes tend to undergo cyclic changes (e.g. WELLER and SPATCHER 1965, WELLER 1978, 1982, VAN DER VALK and DAVIS 1978a,b, 1979, VAN DER VALK 1981). During wet periods nutrients are removed from circulation, accumulated and locked-up in surface litter and soil organic matter, during dry periods they are released through decomposition. Due to recurrent drought, prairie marshes in North America are periodically rejuvenated, a complete cycle requiring from 5 to 35 or more years (VAN DER VALK and DAVIS 1978a). WELLER (1982) argues that natural fires must have occurred regularly in the prairie eliminating the bulk of accumulated plant material, returning locked-up nutrients into circulation and rejuvenating the marsh in a way very similar to that of drought. Whereas drought periods in cool northern ecosystems are too limited in duration and too infrequent to reverse the lock-up process, recent studies (e.g. TOLONEN 1983) indicate that fire has always been an essential ecological factor in northern latitudes. The marsh studied proved to burn anytime of the year provided the weather was sunny and windy since there was a sufficient quantity of contiguous fuel (surface litter) to permit fire

spread even among green Typha stems (KRüSI and WEIN 1988).

The hypothesis that ageing ecosystems can be revitalized through improved nutrient cycling conditions brought about by fire has been termed the "paludification-fire-nutrient release hypothesis" (WEIN 1983), "paludification" or "swamping" being the term proposed by HEILMANN (1966) for the species change associated with the nutrient lock-up process. Up to date, quantitative information and experimental studies concerning the paludification-fire-nutrient release hypothesis are rare. Moreover, there is conflicting opinion as to the degree of revitalization and as to whether paludification is enhanced in moist ecosystems (e.g. HEINSELMANN 1975).

The objective of the present study was to test the paludification-fire-nutrient release hypothesis for a Typha glauca floating mat in a water-level stabilized marsh and to compare the effectiveness of burning with that of draining. In order to get a more precise idea of the extent to which draining and burning affect the nutrient status of the system studied, their impact was compared with that of the application of known amounts of fertilizers viz. (i) nitrogen, (ii) phosphorus, (iii) lime and (iv) nitrogen, phosphorus and lime combined. Burning has been reported to have similar effects on plant growth as liming (FOWELLS and STEPHENSON 1934 cited in RAISON 1979) or as fertilizing with nitrogen and phosphorus (e.g. BURTON 1944, RAISON 1979). Treatment effects were evaluated in terms of phenological and growth characteristics of Typha glauca.

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