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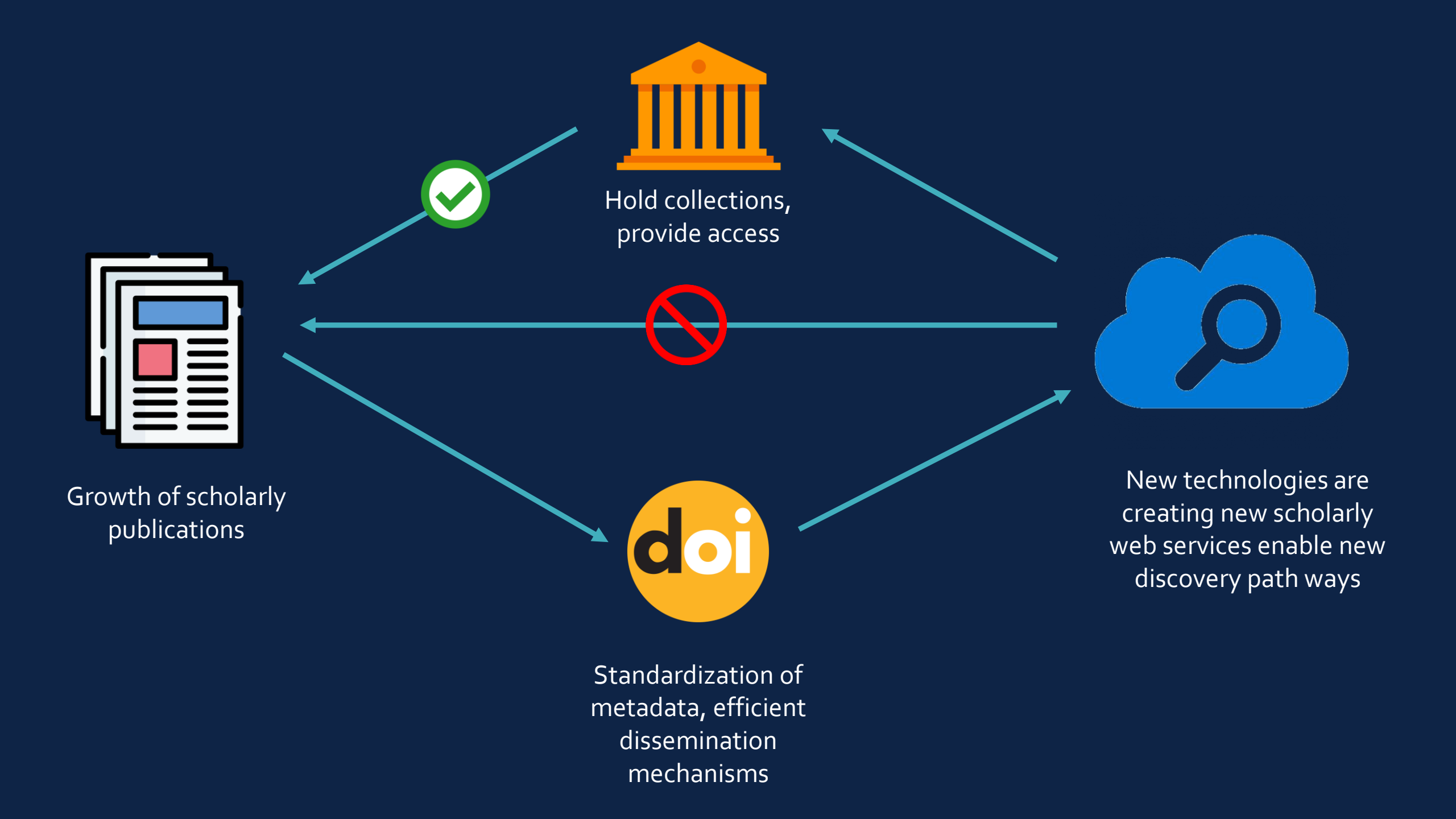
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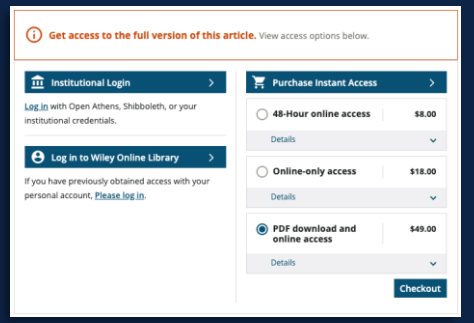

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Management and Conservation Article

From Wiens to Robel: A Review of Grassland-Bird Habitat Selection

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ABSTRACT Efforts to stabilize or increase grassland bird populations require identification of suitable habitat as a first step. Although the number of studies examining grassland-bird habitat selection has increased substantially in recent years, much uncertainty exists regarding local-scale habitat variables that researchers should consider. We reviewed 57 studies and identified important vegetation features correlated with grassland bird abundance, density, occurrence, and nest and territory selection. Our objectives were to 1) guide future studies of grassland-bird habitat use by providing a reduced set of relevant vegetation characteristics, 2) challenge researchers to critically think about what variables to consider, and 3) highlight the need to include consistent definitions of terms used to describe grassland bird habitat. We identified 9 variables that were important predictors of habitat use by grassland birds: coverage of bare ground (important in 50% of the instances where it was included), grass (34% of instances), dead vegetation (33% of instances), forbs (31% of instances), and litter (29% of instances), along with an index of vegetation density (39% of instances) and volume (39% of instances), litter depth (36% of instances), and vegetation height (41% of instances). Only 25% of studies provided information on effects sizes and measures of variance. Furthermore, definitions of measured habitat variables were not consistent among studies. We provide definitions of the 9 important variables and implore authors to report effect size and measures of variance. Standardization of terms and reporting of meaningful results will facilitate replication of wildlife research and enhance our ability to recognize general patterns that emerge from observational studies of habitat use.

KEY WORDS Daubenmire, grassland passerines, habitat models, habitat use, litter depth, vegetation density, vegetation height, vegetation structure.

The widespread decline of grassland birds in North America has been referred to as an unfolding "conservation crisis" (Brennan and Kuvlesky 2005:1). The continent-wide nature of these declines suggests that the causes are not local isolated phenomena and likely involve the loss and degradation of grassland habitat (Vickery et al. 1999*b*, Vickery and Herkert 2001, Brennan and Kuvlesky 2005). Hence, efforts to stabilize or increase grassland bird populations require identification of remaining habitat as a first step (Vickery and Herkert 2001), followed by habitat management and restoration (Brennan and Kuvlesky 2005). Not surprisingly, the number of studies examining grassland-bird habitat selection has increased substantially in recent years.

Two important questions researchers must answer before conducting any type of habitat study are these: 1) what features of the habitat should be measured, and 2) what is the best method for measuring those features. Wiens (1969) contended that a description of bird habitat should provide sufficient detail to differentiate among habitats used by multiple species, yet be suitably flexible and precise to reduce the need to artificially classify and categorize habitat. Furthermore, researchers should consider those habitat features deemed important to the animals being studied (Wiens 1969). Stemming from these requirements, Wiens (1969) developed a protocol for quantifying grassland bird habitat based on structural vegetation characteristics such as density, height, and dispersion. The system is both efficient and easy to use in the field, making it one of the preferred methods for quantifying grassland bird habitat. Many of the structural characteristics included by Wiens (1969) are still perceived to be important for contemporary assessments of grassland-bird habitat use.

Although Wiens' (1969:86) system included a set of carefully chosen variables, he suggested that "…it does not seem proper to restrict consideration, a priori, to a few readily-measurable habitat features which may or may not have any direct relevance to the activity of birds." Numerous studies conducted since Wiens' (1969) monograph have identified relevant vegetation features influencing habitat use that should aid researchers in defining a priori hypotheses regarding grassland-bird habitat selection. This approach would allow development of more robust habitat selection models that could be used to make informed decisions regarding habitat management. Even so, grassland bird researchers still conduct exploratory analyses because they are uncertain of important habitat variables. This is particularly apparent in the grassland-bird Breeding Biology Research and Monitoring Database (BBird) protocol where >40 vegetation parameters are measured at each nest (Martin et al. 1997). Continued use of exploratory analyses and measurement of all potentially important vegetation variables suggests that either no pattern regarding grassland-bird habitat relationships has emerged, or that apparent trends are not being recognized, or are being ignored.

We reviewed studies of habitat selection by grassland birds in North America to 1) summarize methods used by researchers for quantifying grassland bird habitat, and 2) identify patterns of grassland-bird vegetation associations. Our results are intended to 1) guide future studies of grassland-bird habitat use by providing a reduced set of relevant vegetation characteristics for researchers to consider, 2) challenge researchers to critically think about what variables to consider, and 3) highlight the need to include

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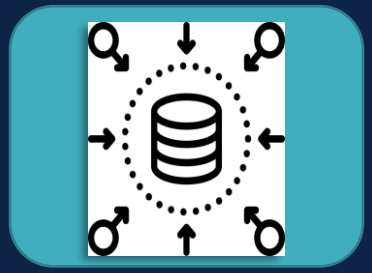

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Article

Separation of Valuable Metals in the Recycling of Lithium Batteries via Solvent Extraction

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Abstract: With the development trend and technological progress of lithium batteries, the battery market is booming, which means that the consumption demand for lithium batteries has increased

Journal Article

Journal Article

Simultaneous recycling of nickel metal hydride, lithium ion and primary lithium batteries: Accomplishment of European Guidelines by optimizing mechanical pre-treatment and solvent extraction operations

August 14th, 2012

Journal of Power Sources

Giuseppe Granata | Francesca Pagnanelli +4

ABSTRACT

In this paper the recycling of nickel metal hydride (NiMH), lithium ion (Li-ion) and primary lithium batteries was examined. Three mechanical routes of treatment were developed for each type recovering mainly three fractions: ferrous metals, non-ferrous metals and electrodic powders. The above mentioned types of spent batteries were also treated together by a unique mechanical route, obtaining in this way a powder enriched in cobalt, nickel and manganese which can be further extractable by chemical leaching. Experimental tests of solvent extraction were performed on synthetic leach liquors simulating a feed mixture of spent devices with weight composition 40% NiMH, 40%

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Simultaneous recycling of nickel metal hydride, lithium ion and primary lithium batteries: Accomplishment of European Guidelines by optimizing mechanical pre-treatment and solvent extraction operations

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ABSTRACT

In this paper the recycling of nickel metal hydride (NiMH), lithium ion (Li-ion) and primary lithium batteries was examined. Three mechanical routes of treatment were developed for each type recovering mainly three fractions: ferrous metals, non-ferrous metals and electrodic powders. The above mentioned types of spent batteries were also treated together by a unique mechanical route, obtaining in this way a powder enriched in cobalt, nickel and manganese which can be further extractable by chemical leaching. Experimental tests of solvent extraction were performed on synthetic leach liquors simulating a feed mixture of spent devices with weight composition 40% NiMH, 40% primary lithium, and 20% Li-ion (as determined by manual sorting of 3 tons of end of life batteries collected in Northern Italy). Under these conditions nickel and cobalt can be easily separated by using Cyanex 272 (stoichiometric ratio Cyanex/Co = 4, pH 5–6), but in presence of manganese Cyanex 272 loses its selectivity towards cobalt. Thus manganese must be preliminarily removed by using D2EHPA (stoichiometric ratio D2EHPA/Mn = 2, pH 4). Mechanical treatments and hydrometallurgical section to recover metals from electrodic powder are unavoidable operations in order to recover at least 50% of batteries as weight according to European Guideline 2006/66/EC.

1. Introduction

Both technological innovation and market expansion lead to a dramatic increase in the production of electric and electronic equipments as well as household batteries necessary for their usage. In particular end of life household batteries become a source of possible contamination because, once in landfill, their components (mercury, lead, copper, zinc, cadmium, manganese, nickel and cobalt etc.), can be leached following up natural infiltration processes [1].

According to the European Guideline, 2006/66/EC [2] which aims to minimize the environmental impact of both productive process and end of life batteries, in the next years several goals must be achieved about collection and recycling. In particular 25% of spent batteries must be collected by September 2012 and 45% by September 2016. Moreover the guideline established that recycling processes of batteries must ensure to achieve at least a 50% of recycling by average weight.

Research activities were focused on the development of economically and environmentally sound processes for battery recycling [3], also considering that they contain considerable amounts of valuable materials and then possible economical benefits for investors in this field. Economical benefits are related to the possibility of both selling all recovered products and earning public money just by the activity of collecting and recycling [4].

In the current literature there are many works concerning the hydrometallurgical treatment of batteries and accumulators. Most of them focused on the treatment of a single-type of devices such as Li-ion [5–7] and NiMH accumulators [8–11]. Important reviews summarizing the technologic advances about battery recycling have been also published [12,13].

In addition only few researchers focused on the recycling of primary lithium batteries [14] and this could be due to the more hazardous and less valuable substances such as Li and Mn, contained in this kind of devices [15].

Many authors mainly focused on leaching investigations and they found up the required operating conditions to dissolve all metals from the electrodic powders. Anyway most works were performed by preliminary manual dismantling of few samples in laboratory scale, without considering the upstream operations of

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