Recovery of the Unique and Threatened Streaked Horned Lark in the Willamette Valley, Oregon: The Need for a Paradigm Shift to Financial Incentives and Targeted Regulation

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PURPOSE AND AUTHOR BACKGROUND

The purpose of this opinion paper is to 1) provide context and critique of the recent Streaked Horned Lark (*Eremophila alpestris strigata*; hereafter lark) Endangered Species Act (ESA) listing (USFWS 2022), 2) highlight the challenges and inadequacies of the current approach to lark recovery, and 3) present an assessment of the pathway to lark recovery based on my approximately 25 years of lark and Willamette Valley monitoring, research, and conservation efforts. It is important to recognize that unless otherwise indicated all statements made herein refer to the Willamette Valley population of larks only.

I conducted the original research on the abundance, distribution, and habitat relationships of the lark in the Willamette Valley in the mid-1990s (Altman 1999) and have been a core leader of the Streaked Horned Lark Working Group since its inception in 2007. After the lark was listed in 2013, I initiated the effort to address lark conservation on private agricultural lands in the Willamette Valley by securing funding to contract with a retired USFWS Private Lands Biologist to conduct outreach to Willamette Valley agricultural producers on lark conservation. I followed this up by initiating the concept, providing the initial funding to stimulate matching funding from other partners (i.e., the USFWS and the Natural Resources Conservation Service [NRCS]), and working closely with a contracted Lark Conservation Specialist in the Willamette Valley for approximately 2.5 years. Based on my background and experience, the USFWS requested my participation on the Lark Recovery Team that resulted in the Draft Recovery Plan (USFWS 2019), and my review of the draft Species Status Assessment (USFWS 2021b) as a "lark expert." I continue to conduct lark monitoring and research at numerous sites in the Willamette Valley, especially prairie restoration sites, and am regularly called upon to provide professional input relative to larks on numerous planning and habitat restoration efforts.

EXECUTIVE SUMMARY

The Streaked Horned Lark is a Pacific Northwest endemic subspecies first listed under the Endangered Species Act (ESA) in 2013 and relisted in 2022 after a legal challenge. Most of the range-wide population occurs in the Willamette Valley, Oregon on agricultural fields and airports where land use activities provide lark habitat but also have the potential for a high degree of conflict with lark nesting.

The ESA listings and associated 4(d) rule exemptions for incidental take were based on false premises and inaccuracies about the benefit to larks from land uses and habitat management, and reliance on broad-brush conservation concepts that failed to account for the uniqueness of this bird and the economic realities of land use where it occurs. These documents promulgate a mostly business-as-usual approach to recovery with heuristic and altruistic strategies that perpetuate the ongoing land uses that have dominated lark habitat during the population declines that lead to the ESA listing. This included the expectation that voluntary conservation was a better approach than regulation, and that a net population benefit would occur with 4(d) rule exemptions. Significant efforts to encourage voluntary conservation with the agricultural community since the listing have not resulted in any advancements on the ground or programmatically. The emphasis on a population benefit from prairie ecosystem restoration was both inappropriate and inaccurate without annual prescriptions for lark-specific conditions. Further, with ESA incidental take exemptions under the 4(d) rule there is no need for the regulatory assurances provided by the USFWS voluntary cooperative conservation programs.

The challenges of lark recovery in the Willamette Valley are much greater than depicted in the listing and its foundational documents, and a reckoning is needed that recovery cannot be achieved by emphasizing voluntary efforts and continuance of the conditions that lead to the larks listing. There is an urgent need for a paradigm shift which recognizes the only way to potentially put the lark on the trajectory to recovery is through financial incentives, especially for establishing essential lark-priority core sites; and targeted, nuanced, and prescriptive regulation that can ensure specific habitat conditions within the context of some federal nexus land management activities.

INTRODUCTION

The Streaked Horned Lark is a subspecies of the wide-ranging Horned Lark (*E. alpestris*) (Beason 1995) and is endemic to the Pacific Northwest (Altman 2011). Its historical range extended from southern British Columbia, Canada, south through the Puget Lowlands and outer coast of Washington, along the lower Columbia River, through the Willamette Valley of Oregon, the Oregon coast, and into the Umpqua and Rogue Valleys of southwestern Oregon (Altman 2011). It has been extirpated as a breeding species in British Columbia (COSEWIC 2018), the San Juan Islands, northern Puget Lowlands, Washington coast north of Grays Harbor County, Oregon coast, and the Rogue and Umpqua Valleys in southwestern Oregon (Pearson and Altman 2005, U.S. Fish and Wildlife Service [USFWS] 2013).

The lark was listed as threatened under the Endangered Species Act (ESA) in October 2013 (USFWS 2013). The listing included a special 4(d) rule that exempted incidental take associated with non-Federal airport operations, normal agricultural activities, and noxious weed management on non-Federal lands. The listing was challenged with a lawsuit in February 2018 by the Center for Biological Diversity (CBD 2018) that targeted the 4(d) rule exemption to the incidental take prohibition for agricultural activities and the listing as Threatened rather than Endangered. In July 2019, a federal court remanded the U.S. Fish and Wildlife Service (USFWS) to submit a new proposed listing rule by March 2022. The new Proposed Rule was submitted to the Federal Register in April 2021 for a 90-day public comment period (USFWS 2021a). The Final Rule, published in April 2022, maintained the listing as a Threatened species and added habitat restoration (hereafter prairie restoration; the only applicable type of restoration related to larks) under the 4(d) rule incidental take exemption (USFWS 2022).

WILLAMETTE VALLEY: RANGE-WIDE CONTEXT

The Willamette Valley ecoregion encompasses approximately 2.4 million acres in northwestern Oregon and is bound by the Columbia River and metro Portland to the north and conifer forest-dominated lands of the Coast Range to the west and Cascade Range to the east (WVOPC 2020). Approximately 93% of the valley is in private ownership and less than 4% is managed for conservation purposes (WVOPC 2020). Over 50% of the private land is in agricultural land use (Morlan et al. 2010).

The estimated range-wide population of the lark is approximately 1,600 birds and approximately 66% occurs in the Willamette Valley (USFWS 2019). Recovery cannot be achieved without its recovery in the Willamette Valley (Henson 2014) where not only does most of the population reside, but there also is the greatest potential landscape characteristics to support increasing populations (USFWS 2016a). All other ecoregions within the lark's range have much fewer birds (USFWS 2019) and a small, patchy distribution of the landscape characteristics required by the bird (USFWS 2016a).

POPULATION STATUS: DECLINING

There has not been a lark-specific survey throughout the Willamette Valley to assess its population status. There are two ecoregional bird surveys that provide abundance or trend information, and there have been lark-specific surveys at several sites since the original ESA listing in 2013.

The Breeding Bird Survey (BBS) has nine roadside routes (i.e., 450 stations) entirely or mostly in the Willamette Valley. There is no trend analysis of BBS data for the Willamette Valley, but there is for the Northern Pacific Rainforest Bird Conservation Region (NPR) which encompasses the entire range of the lark, and for states within the NPR (Sauer et al. 2015). Because the lark in Oregon only occurs in the Willamette Valley, the trend for the State of Oregon in the NPR is equivalent to the Willamette Valley.

The BBS lark population trend for Oregon in the NPR from 1968-2019 is a statistically significant decline of 4.2%/year (Sauer et al. 2020). The short-term trend from 1993-2019 is a statistically significant decline of 5.6%/year. The U.S. Geological Survey provides a yellow code to these trends which indicates caution should be applied when interpreting the results due to the potential issues of low abundance, small sample size, or high variance in the raw data (Sauer et al. 2017). The caution for the lark is automatic because there are less than the standard 14 routes being analyzed and there is a relatively small sample size because of the population status of the bird. However, descriptive presentation of the data clearly shows a decline in relative abundance (Figure 1), and the ability to achieve statistical significance with limited data enhances the likelihood of the accuracy.

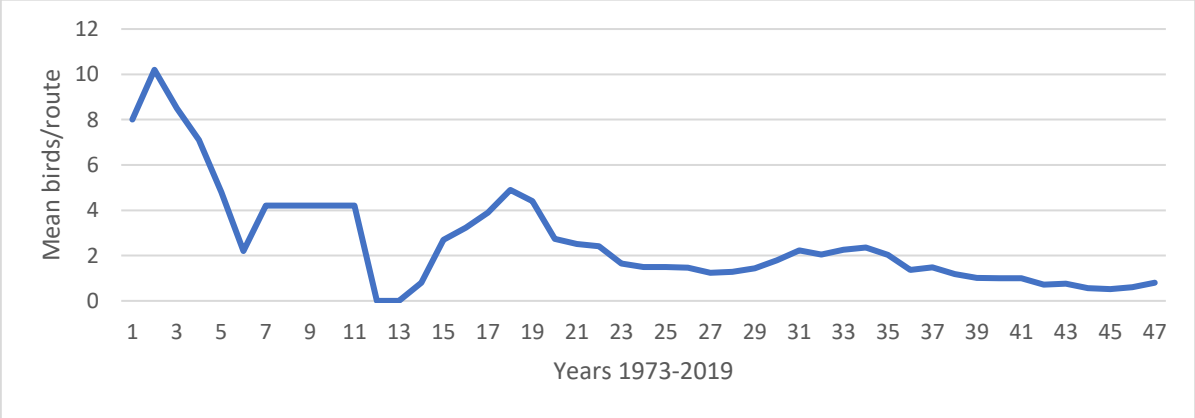

Figure 1. Mean larks/route based on 5-year moving averages on Breeding Bird Survey routes in the Willamette Valley, Oregon, 1973-2019.

The other ecoregional data is from roadside grassland bird surveys at 544 point count stations in 1996 (Altman 1999) and repeated in 2008 (Myers and Kreager 2010). Lark population numbers decreased slightly in the northern Willamette Valley and increased slightly in the middle and southern portions of the valley with an overall increase in detections of 3%. However, this was not an annual trend survey like the BBS but a point-in-time assessment of two surveys 12 years apart with inherent issues of not being able to account for annual variability and using a randomly chosen baseline (Graban 2020). Additionally, these data are before ESA listing unlike BBS data which continues past listing to 2021.

Lark-specific surveys have been conducted on 7-11 sites since 2015 (USFWS 2022), although the Corvallis Airport has had population counts from 2007-2019 (USFWS 2021b). These surveys do not occur within a program of consistent methodology or effort, but opportunistically based on site-specific goals and resources. When standardizing for effort, they indicate an annually variable but similar population between 2015 and 2019, either with or without the Corvallis Airport (Table 1). However, these data are all from airports and conservation lands where consistency of habitat management (airports) or recognition of lark conservation in habitat management (conservation lands) skew towards positive results. Further, they only represent approximately 30% of the lark population in the Willamette Valley (USFWS 2019), and almost all the remaining population is on agricultural lands and subject to multiple potential negative impacts and declining lark habitat as described below.

Table 1. Streaked Horned Lark abundance at monitored sites in the Willamette Valley, Oregon.

	Mean Number of Pairs by Year (sites surveyed)						
	2015 (9)	2016 (7)	2017 (9)	2018 (11)	2019 (9)	2020 (7)	2021 (7)
With Corvallis Airport	12.1	18.1	10.2	12.1	18.3		
Without Corvallis Airport	11.1	11.0	9.1	7.3	10.3	9.7	10.4

Sources: USFWS (2021b, 2022) and Streaked Horned Lark Working Group meeting minutes for 2020 and 2021.

I would suggest the results of the valley-wide, systematic methodology, annual implementation, long duration, and statistical significance of the BBS are more reliable than the valley-wide point-in-time two years of data 12 years apart (Myers and Kreager 2010), or the non-systematic, variable effort, limited locations, short duration, and biased locations of the site-specific surveys. The most reasonable conclusion considering all this data is that the lark population in the Willamette Valley has been declining for many years including the most recent period just prior to and after the listing. The magnitude of concern about the larks' population status has been stated as "throughout their historical range in the Willamette Valley, they are at a high risk of extirpation" (USFWS 2021c).

HABITAT: UNIQUE, EPHEMERAL, AND HIGHLY IMPACTED

Larks nest and forage on the ground within large, open landscapes (e.g., hundreds of acres) of low-statured herbaceous vegetation, a relatively high percent of bare or sparsely vegetated ground, and few to no trees or shrubs (Anderson and Pearson 2015). Not only are these landscapes and conditions unique, they are also ephemeral and require some natural or purposeful actions to set-back succession to maintain the desired sparsely vegetated conditions.

The two ecological processes that historically created and maintained these open landscapes were seasonal flooding and Native American burning (Boyd 1986, Chappel and Kagan 2001). The finer-scaled microsite conditions of sparsely vegetated ground were likely created by seasonal flooding and local variation in soil fertility. The initial declines in lark populations were likely the consequence of the loss and alteration of those natural processes that occurred with Euro-American settlement.

Today in the Willamette Valley, larks occur where human activities have maintained large open landscapes and created sparsely vegetated conditions at smaller scales within those landscapes (USFWS 2017). This includes primarily airports and agricultural croplands (e.g., grass seed fields, row crop fields, Christmas tree farms), and any large, open landscape site where recent ground disturbance results in sparsely vegetated conditions. Habitat loss and alteration continues in these surrogate habitats, but other issues have emerged as primary threats including those associated with small populations such as genetic diversity, recruitment among sites, and negative impacts to nesting and productivity from field operations and other activities during the nesting season (USFWS 2017).

CORE SITES: ESSENTIAL AND ABSENT

Core sites, also referred to as lark reserves (USFWS 2016a), are the highest priority in lark recovery (USFWS 2019). They require lark-specific and lark-prioritized conservation goals and actions at a site with long-term or permanent conservation status and an approved management plan. Recovery goals for core sites throughout most of the Willamette Valley include six primary sites with greater than 50 pairs and 12 secondary sites with greater than 25 pairs (USFWS 2019). An additional three core sites with greater than 15 pairs were established for the northern Willamette Valley.

There are currently no sites that meet the definition of a core site. Populations on agricultural lands or airports cannot be core sites due to other land management priorities (agricultural lands) or policy (airports). Populations on recently disturbed lands are mostly ephemeral and too small to meet the criteria.

National wildlife refuges have the potential to be core sites (USFWS 2019), but this would require changes in refuge priorities and land management plans. Further, some of the current lark population on national wildlife refuges is on land under cooperative farming agreements which cannot be dedicated to lark recovery.

The absence of core sites and the limited opportunities to establish them warrants a sense of urgency to change the current recovery approach. Mitigation or conservation banks with active habitat management (Paulich 2010, USFWS 2018a) likely represent the best opportunity for core sites because of the ability to start from scratch and prioritize larks without competing or other established objectives (USFWS 2016a). Conservation banking is especially effective in areas with strong development pressures and healthy real estate markets (Parkhurst and Shogren 2003) such as the Willamette Valley.

AIRPORTS: CONSERVATION AND RECOVERY DEAD-ENDS

Airports in the Willamette Valley currently support both large and small lark populations (USFWS 2019b). They readily provide the open landscape component of habitat and can provide suitable nesting and foraging conditions along the edges of runways and parking areas in the mix of rock/gravel and sparse vegetation, or in the maintained short-grass buffers outside the runways where suitable micro-habitat conditions are available (e.g., small drown-outs, low productivity soil). Habitat also can occur in some larger airports with fields leased for agriculture that provide suitable conditions, although these are more appropriately considered agricultural fields based on land use rather than ownership.

Airports are recovery dead-ends for larks because of both policy and threats. It has been established by policy that there is no role for federal airports in lark habitat enhancement or recovery as documented in a Memorandum of Understanding between the Federal Aviation Administration (FAA) and the USFWS (FAA and USFWS 2019). In the designation of Critical Habitat for the lark, airports were appropriately excluded (USFWS 2013).

Beyond policy, there are inherent limitations on lark populations with mortality from airstrikes (Dolbeer 2011) and regular mowing to maintain low grass heights (USFWS 2022). Larks are one of the most frequent bird species hit by planes (Zakrajsek and Bissonette 2005, Dolbeer 2011). Recent examples of increases in airstrikes have occurred on airports with increasing lark populations in the Puget Lowlands (USFWS 2022). There is likely some threshold where lark population size and increases are negated by increased likelihood of airstrikes.

AGRICULTURAL LANDS: ATTRACTION, DANGER, AND ECONOMIC PRIORITIES

Approximately 70% of the Willamette Valley population of larks occurs on agricultural lands, especially in association with grass seed fields, the predominant agricultural type in the region (USFWS 2021a). Suitable lark habitat in agricultural fields occurs in sparsely vegetated areas between crop rows; in swales, depressions, or areas of low productivity for crop or vegetation growth; in sprayed-out field borders, edges, and ditches; and farm roads and equipment parking areas (USFWS 2021b).

During the 1970-1990s, grass seed field acres were increasing (Figure 2) at the same time lark populations were declining (Figure 1). Although correlation does not equal causation, this relationship is consistent with the well-documented literature on birds in intensively managed agricultural landscapes (van Vliet et al. 2020) including potential negative consequences of intensification and homogenization of agriculture on ground-nesting birds (e.g., Warner 1994, Donald et al. 2006, Guerrero et al. 2012, Denac and Knecl 2021, van Vliet et al. 2020). These include negative impacts on breeding success from destruction of nests from farm machinery (Galbraith, 1988, VanBeek et al. 2014), reliance on chemical use (e.g., pesticides and fertilizers) (Matson et al. 1997), and reductions in insect prey resources compared to natural lands or less-intensively managed farmland (Geiger et al., 2010). Lark adult mortality has been associated with the rodenticide zinc phosphide in the Willamette Valley (USFWS 2021b) and nestling mortality from equipment operations in fields (personal observations).

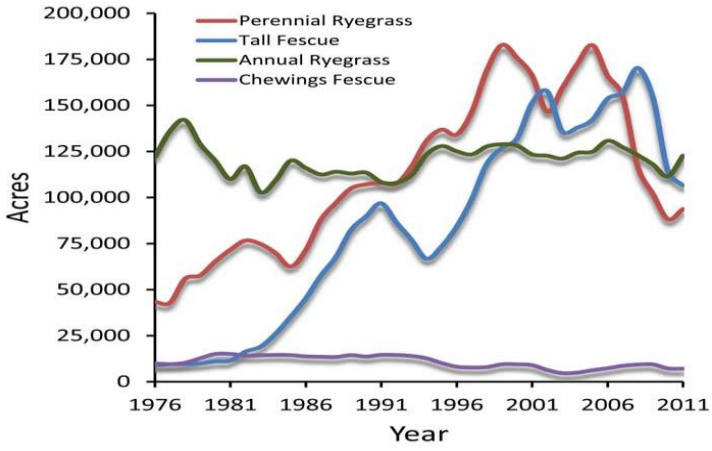

Figure 2. Grass seed crop acreage trends in the Willamette Valley, 1976-2011 (Oregon State University 2012).

The questionable role of agricultural lands in lark conservation is further exacerbated by a recent (2005-2021) decrease in grass seed field acres by approximately 32% or 155,000 acres (Oregon State University 2005, U.S. Department of Agriculture 2021). Growers have switched to other commodities based on market demand and opportunities (USFWS 2016b, 2022), especially hazelnuts which have more than doubled in acres from 2011-2020 (Oregon Department of Agriculture 2022) but do not provide suitable habitat for the lark (USFWS 2021b, 2022).

Lastly, another confounding factor with lark conservation on agricultural lands is the economic realities of markets and inevitable crop changes or modifications over time. Thus, fortuitous lark habitat created by some agriculture is tenuous and not appropriate to meet long-term conservation goals, a basic tenet of species recovery under the ESA.

AGRICULTURAL LANDS: FALSE RATIONALE OF VOLUNTARY CONSERVATION

There has been significant recent emphasis on the potential for voluntary conservation to contribute to the recovery of listed species (Sorice et al. 2010, Wollstein and Davis 2017, Henson et al. 2018, Epanchin-Niell and Boyd 2020). This includes altruistic actions, but especially incentivized USFWS programs such as Safe Harbor Agreements (SHA), Candidate Conservation Agreements (CCA), and Habitat Conservation Plans (HCP). The latter have been established specifically to encourage proactive conservation efforts by non-federal landowners while providing them certainty that future property-use restrictions will not be imposed if those efforts result in increased numbers of listed species (Langpap and Wu 2004).

The primary justification for the 4(d) rule for private land agriculture operations was that these activities create lark habitat and most of the lark population was on agricultural lands, and that voluntary cooperation was more likely to be successful than regulation on private lands (Henson 2014, USFWS 2022). An often-referenced successful example of the latter is the efforts to support voluntary conservation in family-owned ranchlands in the intermountain west to prevent listing of the greater sage grouse (Brownscombe et al. 2015, USFWS 2015). However, the lark was inappropriately painted with this same broad-brush concept without recognizing two major differences from the successful application of the voluntary approach for greater sage grouse. First, greater sage grouse conservation participants were motivated by a well-funded program that aligned with production goals (Wollstein and Davis 2017). A funded program like this does not exist for the lark, and as described above alignment with production goals is highly unlikely in intensively managed cropland where planting, spraying, and harvesting occur during the breeding season. Secondly, unlike ranchlands in the intermountain west which are often generational family ownerships with some degree of land stewardship and long-term thinking, Willamette Valley agricultural fields, especially grass seed fields where larks occur, are not family legacies and are mostly not farmed by the family that owns the land. They are leased to corporate entities where every square inch of land represents a dollar sign and immediate profits supersede any long-term goals or recognition of land stewardship.

The rationale of private landowners, especially producers, being receptive to voluntary conservation for the lark was clearly disproven based on a nearly three-year funded outreach effort to engage this community in lark conservation. The USFWS, American Bird Conservancy (my employer at the time), and the Natural Resources Conservation Service (NRCS), spent approximately $175,000 to fund both an initial contract to a former USFWS private lands biologist and a 2.5 year contract for a Lark Conservation Specialist position. The purpose was to work with agricultural producers to promote and implement farming practices that support lark conservation and assist landowners with enrolling in federal incentive programs (USFWS 2016a). The efforts failed to achieve any positive outcomes relative to on-the-ground habitat projects, development of incentive-based agreements or programs for agricultural producers, nor cooperative small pilot projects when funding was offered to support such efforts. Both contracted individuals indicated that there was no incentive for the producers or landowners who already had an incidental take exemption under the 4(d) rule to engage with the federal government on lark conservation. The failure to mention this effort in the proposed rule (USFWS 2021a) or final rule (USFWS 2022) is a major error of omission that conflicts with the rationale that voluntary cooperative conservation would be a major part of lark recovery on private lands.

In the nine years since the lark has been listed, there has been one SHA for larks on private non-agricultural land. This was with a conservation-minded landowner who was changing production lands (i.e., grass seed fields) into wildlife habitat and agreed to dedicate approximately 65 acres specifically for larks (USFWS 2021c). There has been an influx of larks during the first two years of habitat conversion in both the lark area and throughout the property with a decline in year three, especially in the lark area (personal observation). However, even the entire site (lark and non-lark areas) would not meet the criteria for a core site based on the maximum lark population during the ground disturbance period of restoration (i.e., <20 pairs). Even with mandated habitat management and activities restrictions under the SHA, the lark population will likely be <10 pairs as the surrounding prairie matures.

It was hoped this site would provide a template for similar efforts on other private lands and increase landowner participation in SHAs and other voluntary programs (C. Brown pers. comm.). However, as discussed below regulatory assurances are no longer necessary for any actions on lands undergoing habitat restoration under the blanket incidental take exemptions of the 4(d) rule.

PRAIRIE RESTORATION: EXPECTATIONS EXCEED REALITY

In the last 20 years there has been a significant effort to restore prairie habitat in the Willamette Valley (Wold et al. 2011, WVOPC 2020). Most restoration has focused on creation of conditions that support listed species or general desired ecological attributes (Wold et al. 2011). As described below, the Final Rule (USFWS 2022) inaccurately promulgates the value of prairie habitat and prairie restoration for lark conservation and recovery and reinforces that with a 4(d) rule that provides an incidental take exemption for all prairie restoration activities.

The most pertinent starting point in the discussion of prairie restoration and lark recovery is recognition that the lark has little to no association with prairie habitat both historically and currently. This is clearly stated in the *Recovery Plan for the Prairie Species of Western Oregon and Southwestern Washington* which did not include larks "because its preferred habitat is relatively, bare ruderal grasslands that differed from the native prairies occupied by other species addressed in this recovery plan" (USFWS 2010). This disassociation with prairie habitat was also part of the decision not to include the lark in the *Benton County, Oregon Prairie Conservation Strategy* (Benton County 2010). Although the ultimate decision not to include larks was based on the absence of the bird on county lands, the lark technical committee that I was part of proposed to treat it independently through a species-specific CCA because of its uniqueness relative to the other species (Benton County 2010).

The incorrect range-wide promulgation of prairie habitat and prairie restoration for larks is likely the result of several factors. One is that prairies in the Puget Lowlands can provide suitable habitat for larks because the gravelly, glacial outwash soils naturally inhibit plant growth and provide low-statured, sparsely vegetated conditions (Franklin and Dyrness 1988). However, soils in the Willamette Valley are much more fertile and conducive to plant growth than the Puget Lowlands (Lawrence and Kaye 2006). Further, these conditions are now more exacerbated than historically by the aggressive non-native grasses and forbs that dominate and grow faster, taller, and denser than native grasses and forbs. Even attempts to increase spacing in seeding prairie vegetation to provide more sparsely vegetated areas for larks have been unsuccessful as undesirable invasives quickly take advantage of the open ground (J. Beall, pers. comm.) For these same reasons, prairie restorationists do not want bare or sparsely vegetated areas because they become host sites for aggressive non-native grasses and forbs. These conditions also are precluded under programs of the NRCS because vegetation establishment (i.e., not sparsely vegetated conditions) is required for their programs to prevent soil erosion.

Another factor is the frequent observation of larks at sites initiating prairie restoration. However, the occurrence of larks at these sites is not an association with prairie habitat but an association with the

ruderal habitat caused by the initial ground disturbance or largescale broadcast spraying to eliminate the residual crop and weed seeds in the soil. This can result in sparsely vegetated conditions suitable for larks, but it only lasts for 1-2 years (USFWS 2021c). Once the site is seeded and begins to revegetate along with any aggressive growth of invasives, it is either no longer suitable or has marginal suitability for larks if desired sparsely vegetated conditions remain in microhabitats. In some instances, the period of suitability can be extended a year if the site needs more preparation (e.g., total conversion from an agricultural field) or for some reason does not take to the initial preparation and needs to be re-done. However, the continual presence or abundance of larks is dependent on management to maintain specific conditions of sparsely vegetated ground (USFWS 2021c).

It was hoped that the creation of vernal pools within prairie restoration fields would provide annual and potential long-term lark habitat even as the surrounding restored prairie became more vegetated and unsuitable. This was based on observations of "drown outs" in natural depressions or swales in grass seed and other agricultural fields that retain water throughout the winter and inhibit plant growth. However, these depressions or swales also get the same tillage and chemical applications as the rest of the field and the retained water and chemical applications result in limited plant growth even after these areas dry out in the spring and summer. Conversely, vernal pools created as part of prairie restoration that could potentially mimic the agricultural drown-outs get seeded with emergent and other water tolerant plants and receive no chemical applications. Thus, when the water recedes, plant growth can take advantage of the exposure and quickly grow to fill in the area and render it less suitable or unsuitable for larks.

Another factor that reduces the potential value of vernal pools is their limited temporal availability. Lark habitat only potentially becomes available as the water evaporates and recedes providing exposed areas with the potential for sparsely vegetated conditions. However, the degree of available habitat at the start of the nesting season in May is limited by retained winter water depth and spring rainfall. Further complicating availability is the high variability in the rate of revegetation of these exposed areas which is dependent on the soil and seed sources. Some sites maintain sparsely vegetated conditions for part of the nesting season, but others quickly become revegetated and often in a dense, mat-like condition. My extensive observations of these sites over the last 5-10 years indicates there have been many examples of restored prairies with vernal pools that mostly went out of suitability for larks, and a few examples that maintained a population of 1-2 pairs.

Lark conservation in the context of prairie restoration is further challenged by the negative effect of some on-the-ground restoration activities including incidental take during the lark breeding season (USFWS 2022). The greatest potential impact is equipment operations that result in the direct mortality of eggs, nestlings, and recently fledged dependent and non-flying young (Pearson and Hopey 2005). There is data to quantify this based on analyses conducted by USFWS refuge biologists (J. Jebousek, pers. comm.). They calculated the area covered by tire tracks from a typical broadcast spray-out using an ATV with boom and normal tires and a large industrial sprayer with balloon tires to be 15.5% of the ground. That percent would be higher if there were inefficiencies in coverage overlap or excess turning. Thus, every time broadcast spray-outs occur in a field during the breeding season, at least 15.5% of the nests or dependent fledglings are lost. Any other activity that involves equipment in fields would result in some additional mortality.

An indirect impact on larks from prairie restoration is changes in habitat quality after broadcast spray-outs, especially when it is a conversion from agricultural fields. These occur at least once during the breeding season and often a second spraying is necessary. This typically occurs over two years since there is always some degree of non-native seed source issues or failures to kill that are not achieved in one year. If the spray-out is fully effective the habitat becomes less suitable due to a reduction in prey base from the lack of live vegetation. This is especially important to nestlings and recently fledged

young. The spray-out also reduces cover for recently fledged young and makes them more susceptible to predators and weather exposure. I have observed mortality of recently fledged young in these situations where the spray-out removed all live vegetation.

Any assessment of the potential value of prairie restoration to larks also is dependent on their population baseline at that site before restoration, and the status of birds moving into the site. If the restoration site previously was an agricultural field that already supported larks, after prairie restoration it may end up with a similar or smaller lark population than the original agricultural field. This has been documented multiple times and especially in the example of MDAC Farms (USFWS 2021a). Further, the birds that populate the restoration site in the first year do not represent population enhancement. These birds are already in the regional population and have been displaced from other sites that same nesting season. Even though larks have high site fidelity (USFWS 2019) there is regular mid-nesting season displacement due to land management or agricultural operations that disrupt nesting or rapid vegetation succession that renders their habitat unsuitable. If there is successful productivity at the prairie restoration site during the first year then there is potential for new birds to be added to the breeding population if they survive to the following year. However, this still does not necessarily represent a population increase because the same productivity could have been achieved at another site selected by the displaced birds if the prairie restoration site had not been available.

PRAIRIE RESTORATION: 4(D) RULE CONTRADICTIONS AND LOST OPPORTUNITIES

The recent ESA listing (USFWS 2022) added a 4(d) rule incidental take exemption for prairie restoration activities that was not a part of the initial listing (USFWS 2013). The premise of the change was that these activities provide a net benefit to larks from habitat creation and maintenance despite some adverse effects associated with land management and field operations during the breeding season (USFWS 2022). Further, the benefit to larks was considered long-term "by helping to preserve and enhance the habitat quality of existing local populations over time" (USFWS 2022). The mechanisms to achieve a net benefit despite the potential adverse effects from land management are based on the expectation of altruism as indicated by the language of "we encourage" land managers to exhibit "reasonable care" during habitat restoration (USFWS 2022). As described above, not only is the initial premise of the larks' degree of association with prairie habitat inappropriate, there are also multiple factors that preclude a positive response of larks to prairie restoration without lark-specific conservation measures.

In addition to the faulty rational to justify the 4(d) rule for prairie restoration, there was a major opportunity to enhance lark conservation that was effectively taken away with the 4(d) rule – nest protection. The primary reason for an increase in populations of larks on JBLM has been nest protection (G. Slater pers. comm.) implemented because of their requirements as a federal agency to address lark conservation. This has been achieved through nest monitoring by contractors and coordination with military personnel to minimize activities that could result in nest disturbance or destruction. Thus, nest protection is a known activity to promote enhancement of lark populations and has been shown in numerous cases to be an important tool for other listed species recovery such as snowy plover (Dinsmore et al. 2014).

In the original 4(d) rule that did not exempt prairie restoration from incidental take, land managers engaged in prairie restoration with a federal nexus were required to consult with the USFWS. The consultation process provided an excellent opportunity to address potential mitigation measures, including nest protection. I have seen the positive results of that consultation process when several partners reached out to me for nest monitoring after having engaged in the consultation process. I worked with them to secure funding from a variety of sources, including the USFWS. At these sites I work with the conservation entity or land manger to buffer nest locations when essential prairie

restoration activities will be occurring. There are significant opportunities to accomplish similar results at other prairie restoration sites if there is a process to ensure consideration of these actions.

The need for lark-specific conservation measures within prairie restoration also has been recognized in the lone SHA which mandated conservation measures such as monitoring and avoidance of nest areas and other limitations on mowing, prescribed fire, and herbicide spraying during the lark breeding season (USFWS 2021c). It is a complete contradiction to require lark-specific conservation actions during prairie restoration activities in an SHA, while at the same time promulgating a net benefit for those same prairie restoration activities under the 4(d) rule without any requirements for lark-specific actions. If the latter were true then there would be no need for an SHA for prairie restoration, even with a federal nexus, because prairie restoration is deemed as a net benefit. However, as described herein it is the former that is true and the ability to ensure these conservation measures occur was lost with the recent 4(d) rule.

This contradiction of net benefit with the 4(d) rule without prairie restoration conservation measures is further exemplified in several biological opinions for activities on federal lands or under the federal nexus where the applicant is advised of a *likely to adversely affect* opinion and required to meet various lark-specific habitat and activity conditions to ensure a net benefit to larks. For example, farming activities on national wildlife refuges require conservation measures such as minimizing disturbance to nesting birds (USFWS 2016b). Airport runway expansion at the Corvallis airport had numerous measures including on-site avoidance and minimization measures, off-site habitat creation, monitoring, and conspecific attraction (USFWS 2018b). Lark conservation measures for prairie restoration and maintenance at the West Eugene Wetlands included timing restrictions on mowing and prescribed burning (USFWS 2014). Thus, as part of the federal consultation process there are examples of biological opinions of likely to adversely affect for agricultural, airport, and prairie restoration activities with requirements for lark-specific conservation measures. This contradicts those same land uses and activities being deemed a net benefit to larks under the 4(d) rule with continuation of normal operations and no required conservation measures.

In conclusion, the rational for the 4(d) rule for prairie restoration as a benefit for larks is inaccurate at multiple levels including the weak association with larks to prairie habitat, the short-term value of the habitat creation, the initial lark response of population shifting rather than population enhancement, the spatial and temporal limitations of vernal pools, and the negative impacts on productivity from equipment operations during the breeding season. The alternatives to potentially achieve a net benefit for lark habitat or populations from prairie restoration include negotiated commitments through a consultation process (individual or programmatic) or requirements under the 4(d) rule that address the need for lark-specific mitigation activities as part of the restoration. The latter might include habitat additions such as gravely areas; regular and specific types of habitat management such as no seeding in vernal pools, herbicide applications, targeted grazing, or managed flooding; and management of field operations such as timing and location of equipment use, and monitoring of lark nesting. These are standard language in voluntary conservation agreements in the USFWS incentive programs (e.g., USFWS 2021c). However, these are not standard practices in prairie restoration and require some level of consultation or regulation, which has been thwarted with the 4(d) rule.

REGULATORY RECOVERY: SUCCESSES BUT LIMITED SCOPE

The Species Status Assessment and Final Rule list multiple efforts that have been implemented since the ESA listing in 2013 to provide positive outcomes in maintaining or improving local population status for the lark (USFWS 2021b, 2022). What is clear from a perusal of these examples is that all were a result of consultations from regulation under the ESA with other federal agencies or entities with a federal nexus in their activities. These include multiple National Wildlife Refuges, Joint Base Lewis McChord

military activities, Federal airports, and HCPs for the Port of Portland and U.S. Army Corps of Engineers dredge spoils along the Columbia River. In the Willamette Valley, this list only includes Federal refuges. Further, during the nine years since listing there have been three HCPs developed for larks in the Puget Lowlands population, two for the Columbia River population, and none for the Willamette Valley population (USFWS 2016a, 2021b, 2022). As described above, there has been one SHA in the Willamette Valley that is now moot with the 4(d) rule exemption for prairie restoration. Lastly, the current limitations of regulation to federal lands or activities with a federal nexus limits its effect on lark population status in the Willamette Valley because approximately 70% of the population is not included. Thus, regulation can be successful, but the federal nexus outside the 4(d) rule does not support enough landscape or commitment to achieve recovery goals.

Regulation does not have to be extensive or absolute. It can be targeted and nuanced and still achieve meaningful conservation and recovery results. An effective and fair 4(d) rule also should have provided finer scaled and spatially explicit incidental take exemptions that accurately reflect the uniqueness and variations of the lark's ecology and land use/management throughout its range. For example, as described above there is clear distinction between the higher value of prairie restoration to larks in the Puget Lowlands than the Willamette Valley. Although there is potential value in vernal pools as part of prairie restoration, they have to be required (many prairie restoration projects do not include them), and they have to have specific features prescribed such as size and depth of the pool, lack of seeding, and annual assessments of actions to ensure sparsely vegetated conditions. Some or all of these and other conditions can be established through regulatory process such as the 4(d) rule or through consultation at the project or programmatic levels.

The rationale for the absence of regulation in the 4(d) rule emphasized the problems of timing restrictions on land managers activities during the lark breeding season (USFWS 2022). Yet the USFWS biological opinion for restoration and maintenance activities in the West Eugene Wetlands has conservation measure standards that restrict the timing of mowing and prescribed fire during the lark breeding season (USFWS 2014). Further, the lone lark SHA emphasizes the need to conduct monitoring and "direct management activities away from likely nesting areas and/or stagger treatments to allow nests to be incubated, hatched, and fledged on known occupied sites before management activities occur" (USFWS 2021c). It further provides extensive and nuanced direction on mowing, prescribed fire, and herbicide spraying that balances lark conservation with the need for habitat management to maintain habitat.

Targeted regulation could also be delineated between agricultural operations in Christmas tree farms and grass seed fields because of the greater potential conservation benefit in Christmas tree farms. The most significant differences between the two is the timing of harvest (outside the breeding season in Christmas tree farms and during the breeding season in grass seed fields), and the much greater risk of negative impacts on productivity in grass seed fields. In Christmas tree farms, pruning and shaping occurs in March prior to the breeding season, and the only activity during the lark breeding season is occasional weed spraying. In contrast, in grass seed fields there are several other activities during the breeding season in addition to harvest including mechanical spraying and often plowing or mowing in conjunction with harvest.

UNINTENDED CONSEQUENCES: DISINCENTIVES WITH 4(D) RULE EXEMPTIONS

There have been several publications on the negative unintended consequences of a regulatory approach to species conservation and recovery on private lands (e.g., Leuck and Michael 2003, Knapp et al. 2015, Henson et al. 2018). It is not the purpose herein to evaluate that premise, but it is appropriate to discuss how in this case the decision to emphasis voluntary conservation also results in unintended consequences that are a barrier to recovery since the concept of unintended consequences from

regulation was used as one justification for the 4(d) rule for agricultural operations and prairie restoration (Henson 2014, USFWS 2022).

The 4(d) rule for agricultural operations in effect since the original listing (USFWS 2013) has resulted in disincentives for engagement from that community. This was the outcome of approximately three years of contracted efforts to engage with the agricultural community as described earlier. The combination of the incidental take exemption under the 4(d) rule which provides immunity from legal requirements, the type of agriculture (i.e., intensively managed cropland, not family ranches), and the nature of the land management and ownership (i.e., mostly leased to corporate operations) has resulted in no motivation for voluntary cooperation to support lark conservation. This lack of interest by individual landowners or farmers has also been the outcome of ongoing efforts by many individuals, agencies, and organizations since before the bird was listed, in particular through NRCS programs and staff and their close workings with private landowners.

The addition of the 4(d) rule for prairie restoration in the recent listing (USFWS 2022) has resulted in lost opportunities for implementation of essential lark-specific habitat requirements through required consultation, which were successful on lands with a federal nexus prior to the add-on of prairie restoration to the 4(d) rule. With no consultation process and an exemption from incidental take for prairie restoration, there is no requirement for conservation partners even with a federal nexus to consider lark conservation, and in fact there is a disincentive due to the added workload and costs. The prairie restoration add-on also disincentivized participation in USFWS voluntary incentive programs such as SHAs, CCAs, or HCPs. Land managers now have an exemption from incidental take for all their activities and no need for the assurances under these programs.

NEED FOR A PARADIGM SHIFT: FINANCIAL INCENTIVES AND TARGETTED REGULATION

The current approach to lark recovery is not working as described herein. It is handicapped by numerous factors including:

- the bird's unique habitat requirements and ephemeral availability of that habitat,
- the occurrence of most of the population on private intensively managed croplands or conservation dead-ends (i.e., airports),
- the complete absence of essential core sites and no pathway to achieve them,
- an inappropriate emphasis on voluntary conservation and ecosystem management (i.e., prairie restoration),
- reduced regulation with the new 4(d) rule that resulted in the loss of essential nuance to prairie restoration,
- unintended consequences of the 4(d) rule that disincentivizes engagement with the most important communities (i.e., agricultural and prairie restoration),
- expectations that greatly exceed reality (i.e., the contributions of agricultural lands and prairie restoration),
- negative impacts on productivity, including mortality, due to human activities during the breeding season (agricultural lands, airports, and prairie restoration),
- the direct conflicts of sparsely vegetated habitat conditions with prairie restoration goals and conservation programs under the NRCS, and
- the ongoing permanent loss of its human-altered habitat to development and conversion of agricultural crops that provided some suitable habitat (i.e., grass seed fields) to those that provide no habitat (e.g., filberts, vineyards).

The limited successes (e.g., the singular SHA and regulated actions on Federal wildlife refuges) are not sufficient to offset the failures let alone address recovery goals.

The unique ecology of the lark within a landscape dominated by private intensively managed croplands requires a non-traditional approach to recovery. Threading the conservation and recovery needle will require a paradigm shift from the current approach focused on altruism and accommodation of land use and land management that lead to the ESA listing. The new approach should emphasize financial incentives to entice cooperation and targeted regulations that promote desired habitat conditions. The former will require a species-specific initiative with resources that monetizes incentives for lark conservation and/or development of programs (e.g., mitigation or conservation banks from applicable federal nexus credits, farmer buy-outs or harvest delays) that financially support landowners and land managers. The latter will require lark-specific best management practices as part of the 4(d) rule or requirements of federal nexus consultation where these desired conditions can be discussed and developed specific to the project (e.g., prairie restoration).

Regulation, species-specific initiatives, financial incentives, and more protected land are not popular themes within certain segments of the public and government agencies. However, the use of funded species-specific initiatives such as the NRCS Working Lands for Wildlife program has been successful for species such as golden-winged warbler and red-cockaded woodpecker in addition to the greater sage grouse example described earlier. This approach also has great potential for the lark since agricultural lands provide an opportunity for incentives to pay for positive outcomes on lark reproduction or conservation. A successful example of this is the practice of buying out a crop or delaying harvest to prevent nest destruction during active nesting of tri-colored blackbirds in California (Meese 2009). Establishing a program with adequate resources whether with an agency or a non-profit intermediary would provide financial alternatives that are likely to be essential for lark recovery and are more likely to be successful than the altruistic USFWS assurance programs which are not receiving the level of interest necessary and have been disincentivized by the 4(d) rule.

The highest priority that needs to be implemented to change that current conservation paradigm and move the lark in the trajectory of recovery is to create a partnership program(s) that provides financial resources to secure agreements with individuals, organizations, or agencies to establish and maintain several "lark reserves" that meet the criteria of core sites. These could include mitigation or conservation banks on non-public lands, re-purposed government lands, conservation-minded landowners on private lands, etc.

There are two other priorities that can provide some annual lark population enhancements. Both are supplemental and secondary to the essential establishment of core sites. They include:
- Stipulate targeted and nuanced lark-specific conservation measures within the 4(d) rule for prairie restoration or remove prairie restoration from the 4(d) rule and return to the consultation process where there is a federal nexus, and these conservation measures can be discussed and applied on an individual or programmatic basis. These could include annual habitat enhancements, monitoring and nest protection, timing and logistics of field operations, etc.
- Create a partnership compensation program(s) that pays for appropriate conservation actions for larks on agricultural lands. These could include payouts for crop buy-outs or harvest delays, fallowed fields, annual habitat enhancements, nesting avoidance measures, etc.

There can be debate within these priorities about the specifics of the conservation measures, likelihood of success, the challenge of implementation, the ability to secure resources, etc. However, at the end of the day there cannot be resignation to those challenges with no change in the current approach. It is an admirable and sometimes achievable goal to promote voluntary bird conservation for species recovery. It is also an admirable and sometimes achievable goal to want to meet these goals through the broader goals of ecosystem restoration. Both are non-starters in the Willamette Valley for this bird in this landscape.

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