WASHINGTON NATURAL HERITAGE PROGRAM

Assessment of Potential Recovery Actions for *Lomatium bradshawii* within the Lacamas Prairie Natural Area Preserve and Vicinity

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Fish & Wildlife Service

Prepared by

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ON THE COVER: *Carex densa - Deschampsia cespitosa* Wet Meadow (G2/S1) at Lacamas Prairie Natural Area Preserve [Background] provides habitat for federally endangered *Lomatium bradshawii* (G2/S1) [Foreground].

Photographs by Tynan Ramm-Granberg unless otherwise noted

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Introduction

Lacamas Prairie, northwest of Camas, Washington, is considered the highest-quality wet prairie remaining in the state (Figure 1). The site is noteworthy for containing eight state-endangered, threatened, or sensitive vascular plant species, including the federally endangered species *Lomatium bradshawii* (G2/S1) (Table 1). The site also supports three rare plant communities (Table 2). Because of its significance, the Washington Department of Natural Resources (DNR) established the Lacamas Prairie Natural Area Preserve (NAP) and Natural Resource Conservation Area (NRCA) in 2006. The established boundary for the combined NAP and NRCA encompasses ~1820 acres. Of that, DNR has acquired 201 acres, which the DNR Natural Areas Program manages with the objective of conserving both the rare plants and rare plant associations.

Figure 1. Map of Lacamas Prairie NAP and treatment units used as sub-assessment areas (sub-AAs).

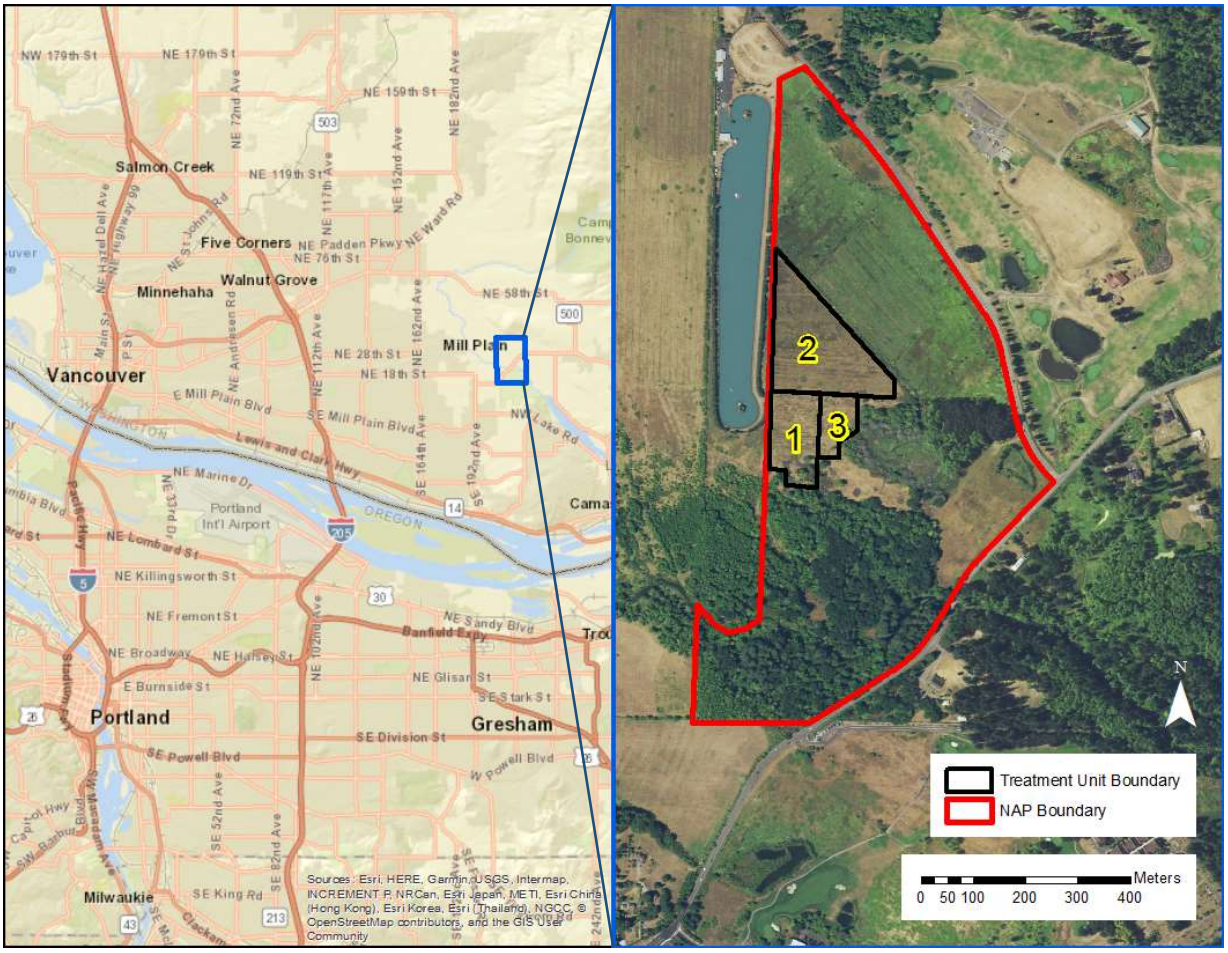

Table 1. Rare plant element occurrences of Lacamas Prairie NAP and their Conservation Status Ranks.

Scientific Name	Common Name	Conservation Status Rank	State Status	Federal Status
Carex densa	Dense Sedge	G5/S2	Sensitive	Sensitive
Wyethia angustifolia	California Compassplant	G4/S1	Sensitive	--
Trillium parviflorum	Small-Flowered Trillium	G2G3/S2S3	Sensitive	Sensitive
Lomatium bradshawii	Bradshaw's Desert-Parsley	G2/S1	Endangered	Endangered
Isoetes nuttallii	Nuttall's Quillwort	G4?/S2	Sensitive	Sensitive
Eryngium petiolatum	Oregon Coyote-Thistle	G4/S2	Threatened	Sensitive
Symphyotrichum hallii	Hall's Aster	G4/S2	Threatened	Strategic
Penstemon hesperius	Tall Beardtongue	GNR/S1	Endangered	

Table 2. Plant association element occurrences of Lacamas Prairie NAP and their Conservation Status Ranks.

USNVC Plant Association Scientific Name	USNVC Plant Association Common Name	Plant Association CSR
Carex densa - *Deschampsia cespitosa* Wet Prairie	Dense Sedge - Tufted Hairgrass Wet Prairie	G2/S1
Carex pellita Wet Prairie	Woolly Sedge Wet Prairie	GNR/SNR
Quercus garryana - (*Fraxinus latifolia*) / *Symphoricarpos albus* Riparian Forest	Oregon White Oak - (Oregon Ash) / Common Snowberry Riparian Forest	G2/S2

One challenge in restoration work is evaluating changes in ecological condition in response to treatments. While permanent vegetation plots can track changes in plant community composition over time, changes in ecosystem processes and function can only be inferred. WNHP ecologists regularly use Ecological Integrity Assessments (EIA) to evaluate the current ecological condition of plant association occurrences. An EIA is a systematic multi-metric assessment of the current ecological integrity of a plant association occurrence (Faber-Langendoen et al., 2016 and in press). The goal of an EIA is to provide a concise evaluation of the composition, structure, processes, size, and landscape context of the occurrence compared to reference (pre-Euroamerican) conditions, while accounting for natural variability (Table 3). EIAs document degradation of these key biotic and abiotic attributes along a continuum from a reference standard (i.e., minimally impacted) to the most highly degraded.

Table 3. Wetland Ecological Integrity Assessment (EIA) metrics used by WNHP.

Rank Factor	Major Ecological Factor	Metric Name	Equivalent Threats or Prairie Quality Assessment Criteria (Appendix D of Recovery Plan)
LANDSCAPE CONTEXT	Landscape Context	L1. Contiguous Natural Land Cover	Isolation/Fragmentation
		L2. Land Use Index	Isolation/Fragmentation, Habitat Destruction
	Buffer	B1. Perimeter With Natural Buffer	Isolation/Fragmentation
		B2. Width Of Natural Buffer	Isolation/Fragmentation
		B3. Condition Of Natural Buffer	Habitat Destruction
CONDITION	Vegetation	V1. Native Plant Species Cover	Cover of native vegetation
		V2. Invasive Nonnative Plant Species Cover	Non-native vegetation (measures all nonnatives, not just invasives; EIA accounts for other nonnatives in V1)
		V3. Native Plant Species Composition	--
		V3a. Diagnostic Species Submetric	Prairie diversity (incorporates fewer factors)
		V3b. Native Increasers Submetric	--
		V3c. Native Decreasers Submetric	--
		V4. Vegetation Structure	Cover of woody vegetation (incorporates fewer factors)
		V5. Woody Regeneration	--
		V6. Coarse Woody Debris, Snags, & Litter	--
	Hydrology	H1. Water Source	--
		H2. Hydroperiod	--
		H3. Hydrologic Connectivity	--
	Soil	S1. Soil Condition	--
SIZE	Size	Z1. Comparative Size (Patch Type)	--
		Z2. Change In Size (Optional)	Habitat destruction

The recovery plan for *L. bradshawii* (and other prairie species) lays out the following criteria for evaluating prairie quality (Table 3): cover of native vegetation, cover of woody vegetation, prairie diversity (native prairie species richness), and nonnative vegetation, with target benchmarks for each (US Fish and Wildlife Service, 2010). Attainment of the benchmarks in each category "indicate[s] that the subject site supports a diversity of native plants necessary to attract and maintain pollinator populations, and has a low level of invasion by non-native species." The plan identifies habitat destruction, isolation/fragmentation, invasive plant species, and succession as the primary threats to the long-term recovery of *L. bradshawii* and other prairie species. EIA assesses all of these factors, while incorporating additional ecological (hydrology, soil, etc.), landscape context, and size considerations.

Another challenge in assessing restoration success and comparing different restoration treatments is that 'standard' vegetation metrics (e.g., percent cover or native species richness) provide only coarse assessments of changes in the vegetation community. In contrast, Floristic Quality Assessment (FQA) indices use vegetation composition to assess the ecological condition of a site based on the concept of plant "conservatism"(Rocchio & Crawford, 2013, and references within). The Washington FQA defines a conservative species as, "A species almost always restricted to intact ecosystems where ecological processes, functions, composition, and structure have not been (or minimally so) degraded/modified by human stressors" (Rocchio & Crawford, 2013). "Coefficients of conservatism" (C-values), which have been assigned to each native species, can be used with any compiled species list to calculate an assortment of indices (Table 5). Using these values, the higher the score for a given index, the better the ecological condition of the site. .

Table 4. Descriptions for ranges of "Coefficients of Conservatism" as presented in Rocchio & Crawford (2013).

Coefficient of Conservatism	Description / Guidance
0-3	Species that readily occur and persist in areas where human stressors have converted ecosystems into human-created habitats such as old fields, tilled or plowed areas, ditches, managed roadsides and utility right-of-ways. These species can also be found in a wide range of ecosystem conditions where ecological processes, functions, composition, and structure range from intact to severely degraded/modified by human stressors. Given that they are very tolerant of a wide-range of frequency, severity, and duration of human stressors, they are not useful indicators of intact ecosystems. These species tend to correspond to Grime's ruderal (0-1) and ruderal-competitive (2-3) species.
4-6	Species that readily occur and persist in ecosystems where ecological processes, functions, composition, and/or structure have been moderately degraded/modified by human stressors. These species are often matrix-forming or dominant species and correspond to Grime's competitor species.
7-8	Species that are mostly restricted to intact ecosystems but can persist where ecological processes, functions, composition, and/or structure are slightly degraded/modified by human stressors; good indicators of intact ecosystems.
9-10	Species that are almost always restricted to intact ecosystems where ecological processes, functions, composition, and structure have not been (or only minimally) degraded/modified by human stressors; excellent indicators of intact ecosystems.

Table 5. Definitions of Floristic Quality Assessment indices calculated for each sub-AA, in each year (for mathematical notation, see Rocchio & Crawford 2015).

Index / Calculation	Definition
Mean C	Mean C-value of all plants (also calculated individually for native species, native shrubs, and native herbaceous species)
Cover-Weighted Mean C	Sum of each species C-value multiplied by its cover values, then divided by the sum of cover values for all species (also calculated for native species only)
FQI	Mean C of all plants multiplied by the square-root of number of all plants (also calculated for native species only)
Cover-Weighted FQI	Cover-weighted Mean C for all species multiplied by the square-root of all species (also calculated for native species only)
Adjusted FQI	Mean C of native plants divided by 10, multiplied by square root of native plants, divided by the square root of number of all plants, and multiplied by 100.
Cover-Weighted Adjusted FQI	Cover-weighted Mean C of native plants divided by 10, multiplied by square root of native plants, divided by the square root of number of all plants, and multiplied by 100.
% Intolerant / Decreaser	Percent of native species with C-value >= 7
% Tolerant / Increaser	Percent of native species with C-value <= 3
Species Richness	Total number of species (also calculated for native species only)
% Nonnative	Percent of species that are nonnative
Wet Indicator (All)	Total wetland indicator values divided by total number of species (also calculated for native species only)
% Hydrophyte	Total number of species with wetland indicator status of OBL or FACW divided by total number of species
% Perennial	Total number of perennials divided by total number of species (also calculated for native species only)
% Annual	Total number of annuals divided by total number of species (also calculated for native species only)
# Species With Moderate Fidelity To Prairies	Number of species with moderate fidelity to prairies of western Washington and the Willamette Valley (Chappell et al., 2004; Alverson, 2009)
# Species With High Fidelity To Prairies	Number of species with high fidelity to prairies of western Washington and the Willamette Valley (Chappell et al., 2004; Alverson, 2009)
% Forbs	Total number of forbs divided by total number of species (also calculated for native species only)
% Graminoids	Total number of graminoids divided by total number of species (also calculated for native species only)

In 2016, we initiated this project to evaluate the impact of ongoing and potential recovery actions for *Lomatium bradshawii* on the other conservation features of Lacamas Prairie—namely the wet prairie plant associations. Modified Ecological Integrity Assessments, FQAs, and standard metrics from permanent-plot vegetation data collection were used to 1) update mapping of plant associations at Lacamas, 2) identify ecological processes necessary to maintain these communities, as well as current stressors, and 3) provide data on short-term ecological trends and baseline vegetation.

Methods

Fieldwork commenced in May of 2016 with assistance from DNR Natural Areas staff and volunteers from the Plas Newydd Farm Conservation Program. Fieldwork consisted of three phases. First, we resurveyed and mapped the known plant association element occurrences (EOs) at Lacamas. EOs are areas with practical conservation value in which a species or ecological community is, or was, present (NatureServe, 2002). Second, we delineated our assessment area and conducted EIAs. Third, we established permanent vegetation plots and collected data via annual site visits.

Mapping

Before data collection could occur, we needed to verify the current extent of plant association EOs. Plant associations were identified using a draft version of the Field Guide to Wetland and Riparian Plant Associations of Washington State (Rocchio et al., unpublished draft). All association names were updated to match their current taxonomy in the U.S. National Vegetation Classification (http://usnvc.org). Rough boundaries were drawn using GPS-enabled tablets running Avenza Maps (Avenza Systems Inc, 2019). All changes to extent and classification were imported to the EO records in WNHP's Biotics database.

Assessment Area

The Assessment Area (AA) for this project encompassed the entirety of the extant wet prairie plant associations within the current NAP boundary. We subdivided the AA into three sub-AAs (i.e. treatment units) based on a combination of current ecological condition, past restoration treatments, and planned restoration work (Figure 1). This subdivision allowed us to track the ecological integrity of different portions of the wet prairie as each underwent restoration treatments (or did not undergo restoration, in the case of sub-AA 2).

Within the AA, the highest quality patch of wet prairie (highest native plant cover, fewest invasive plants, highest cover of diagnostic keystone species like *Deschampsia cespitosa* and *Carex densa*, etc.) is in sub-AA 2 (Table 6, Figure 1, Appendix A). That sub-AA received episodic spot-sprays and shrub patch removal in the years prior to this project, but received no treatments from 2016-2018 (i.e. during this project). In contrast, sub-AA 1 is highly degraded and dominated by *Alopecurus pratensis*, but it also contains the greatest density of *Lomatium bradshawii* within the preserve boundary. Sub-AA 1 was burned in the fall preceding our first round of data collection, then sprayed with herbicide and reseeded/plugged with native species. Sub-AA 3 is similarly degraded, but with fewer *Lomatium bradshawii*. It is also experiencing a greater degree of shrub/tree invasion from the neighboring *Quercus garryana - Fraxinus latifolia / Symphoricarpos albus* woodland (itself a rare plant association) on its eastern flanks. Sub-AA 3 was burned in the fall of 2016 (after our first round of data collection) (Figure 2), then sprayed with herbicide, reseeded, and plugged, similar to sub-AA 1. The ultimate goal of restoration work at Lacamas Prairie is to maintain and, if possible, increase the population of *Lomatium bradshawii*, while also improving the ecological condition (as measured by EIA) of sub-AAs 1 and 3, as well as degraded areas not included in this study. Note that previous reports (Reynolds, 2004) have identified sub-AAs 1 and parts of 3 as the areas of highest quality prairie, but that was based purely on the relatively large number of *Lomatium bradshawii*. Sub-AA 2 has much higher diversity and

abundance of native wet prairie plant species and is the only sub-AA that resembles a native wet prairie plant association. Appendix A presents a full breakdown of treatment histories.

Figure 2. Prescribed Burn of Sub-AA 3 (Fall 2016) (Photo by Carlo Abbruzzese)

Table 6. Sub-AAs (Treatment Units) at Lacamas Prairie NAP.

f	Area (ac)	# of Vegetation Modules / Cover Quadrats
1	3.9	5
2	8.9	10
3	1.8	5

Additional wet prairie exists on private property to the west (along with a large population of *Lomatium bradshawii*), but that parcel was not included in this assessment. Previous surveys have suggested the wet prairie there to be relatively intact, aside from woodland encroachment (Habegger, 1998; Reynolds, 2004), and we recommend a future assessment of that area using EIA methodology.

Ecological Integrity Assessment

Following mapping, Ecological Integrity Assessments were conducted for each plant association EO.

EIAs can be conducted at three different levels of sampling intensity:

- Level 1 - GIS-based landscape assessments
- Level 2* - Rapid, field-based assessments, often based on qualitative measures
- Level 3 - Intensive field-based assessments, quantitative-based measures

We used a modified level 2 approach incorporating more intensive, repeat sampling with permanent vegetation plots (for more information on EIA protocols see Rocchio et al. 2016).

EIAs were conducted in 2016 and again in 2018, following restoration treatments. Landscape context and size metrics were scored for the full AA. Meanwhile, condition metrics (V1-4, H1-3, and S1) were scored separately for each sub-AA. These metric ratings were then combined into ratings for the full AA, with each sub-AA weighted by its percentage of the total area. Individual metric scores provide insight into specific management needs, goals, and measures of success. For example, a low score in the Invasive Nonnative Plant Cover metric (V2) may indicate the need for further herbicide treatment. Each metric rating was rolled up into an overall EIA Rank, a measure of ecological integrity, and EO Rank, which incorporates size and indicates the overall conservation value of the EO.

Vegetation Data

Permanent Quadrats

Level 2 EIAs usually incorporate a site walkthrough approach to vegetation data collection, sometimes supplemented by temporary relevé plots, but this project required greater sensitivity to *short-term* vegetation trends. A combination point-intercept/nested-quadrat protocol (as in Elzinga et al., 1998) was used initially, but proved too time-intensive for the scope of this project. We chose instead to use modified Carolina Vegetation Survey methods (i.e. "Peet Plots") (Peet et al., 1998) that had the added benefit of rolling-up more cleanly into our existing EIA methodology. Each sub-AA was sampled using a deconstructed Peet plot, consisting of either five or ten randomly distributed 100m^2 modules within each sub-AA, depending on the size of the sub-AA. Each module was marked at the corners with orange survey stakes and GPS points were recorded. Additional quadrats of 10 m^2, 1 m^2, 0.1 m^2, and 0.01 m^2 were nested within one another and placed in opposite corners of the module (resulting in 9 total frequency quadrats per module) (Figure 3). Covers for each species were then estimated across the module (i.e. the 100 m^2 quadrat) using the following cover classes: 0-1, 1-2, 2-5, 5-10, 10-25, 25-50, 50-75, 75-95, and 95+ percent.

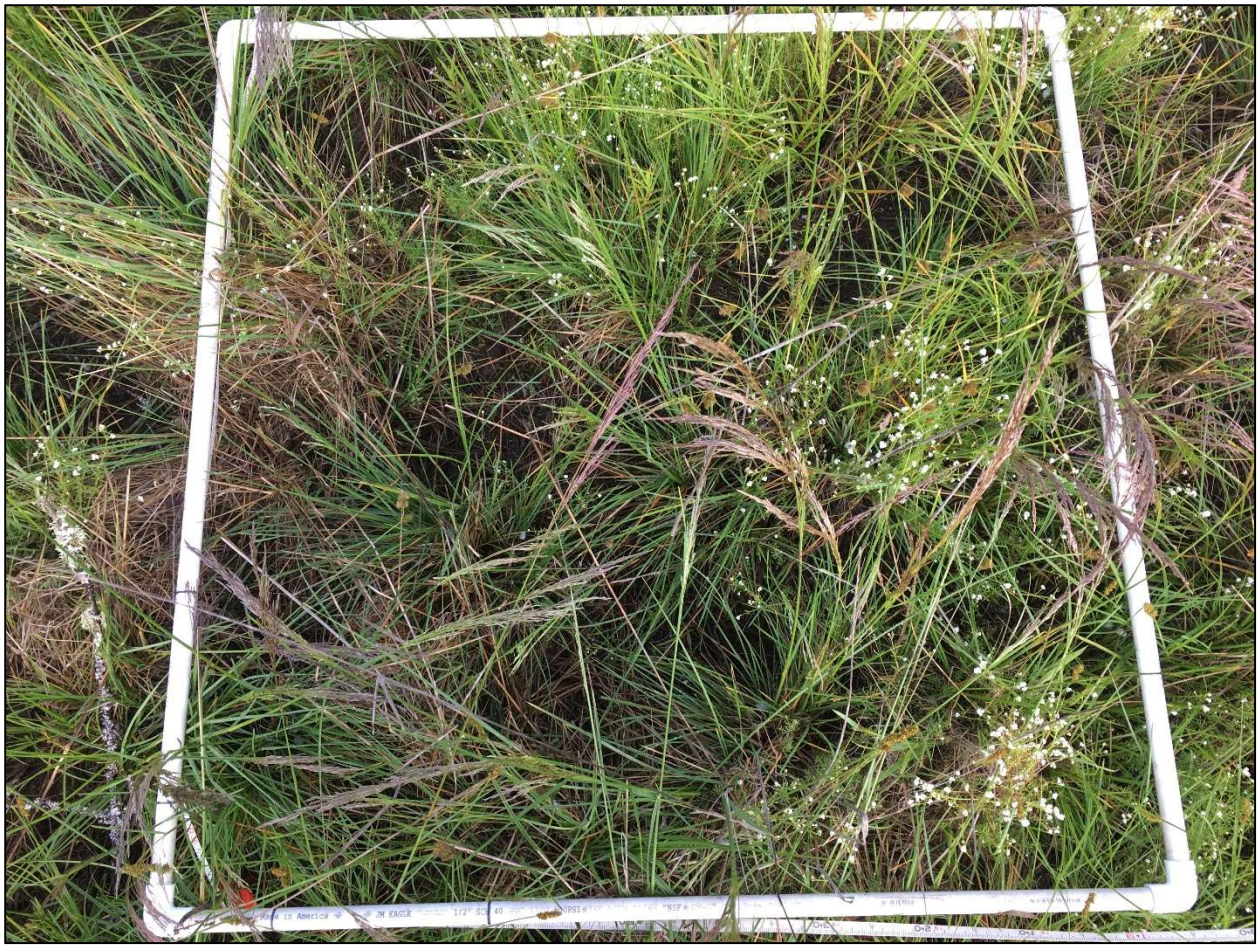

Figure 3. 0.01, 0.1, and 1 m^2 quadrats (see marks along border of PVC tubing) from a module in sub-AA 2.

Plants were identified to species, subspecies, or variety level when possible. All plants rooted within a given quadrat were recorded. Species were keyed using a working draft of the Flora of the Pacific Northwest, 2nd Edition (Hitchcock & Cronquist, 2018). All names presented in this report match the taxonomy used in the University of Washington Burke Herbarium Washington Flora Checklist as of November 29, 2018 (University of Washington Herbarium, 2018). We did not record plants if they had already been found within a smaller quadrat in each nest (i.e. each corner of the module). Cover was assessed by estimating a circle around the outermost area covered by the plant. In 2017 and 2018, we attempted to match our sampling efforts to the same phenological stage as 2016 based on the inflorescences of *Deschampsia cespitosa* (they had just begun to "open up" at the time of sampling in 2016). Nevertheless, sampling occurred slightly later phenologically in 2017 and 2018. In 2018 in particular, following one of the driest springs on record, the swales and ditches within the AA were almost entirely dry. This left some annual species desiccated and unidentifiable.

Floristic Analysis

Cover and Frequency

Relative native plant cover (V1) and absolute cover of invasive plants (exotic plants known to form large monocultures or otherwise modify ecosystem function, V2) were calculated for each

sub-AA, in each year, and used in scoring the EIA. Additionally, short-term trends in cover and frequency were calculated for each species. The appropriate quadrat size for each species was chosen by calculating the species' frequency in each quadrat-size over the entire AA in the 2016 field season. The smallest quadrat with an initial frequency between 30% and 70% was then used to track trends (Elzinga et al., 1998). Plants that were not found in 2016 were tracked via the 100-m^2 quadrat if they appeared in subsequent years. Species tracked with 100-m^2 quadrats had five samples per year in sub-AAs 1 and 3, while 10 samples were collected in the larger sub-AA 2. Species tracked with smaller (nested) quadrats had 20 samples in sub-AAs 1 and 3 and 40 samples in sub-AA 2.

Because the quadrats were permanent (not independent samples), we analyzed cover values with paired t-tests and frequency data with McNemar's chi-square tests (both using significance cutoffs of $p \leq 0.05$) (Elzinga et al., 1998). These analyses looked for variation *within* each sub-AA, as well as the AA as a whole. However, overall sample sizes were too small to analyze variation *between* sub-AAs. All statistical analyses were done using R version 3.4.3 (R Core Team, 2017) in RStudio (RStudio Team, 2016).

Floristic Quality Assessment

C-values aided in the scoring of native plant species composition (V3) during the EIA. Plants with C-values of 1-3 were generally considered "native increasers" (tolerant of anthropogenic disturbance) and species with C-values > 6 were considered "native decreasers" (intolerant of anthropogenic disturbance). Additionally, multiple FQA indices were calculated for each sub-AA, in each year, allowing us to track short-term trends in the floristic quality of each sub-AA.

Plants that could not be identified to species were left out of FQA analyses unless they were certainly nonnative (e.g. an unidentified annual *Bromus* is very likely nonnative and all nonnative species have a default C-value of 0), though they were retained for physiognomic calculations such as "% forbs". When calculating cover-weighted indices, cover values were combined for all strata of a given species (e.g., cover of *Crataegus douglasii* seedlings and shrubs were merged).

Results

EIA results, FQA indices, and short-term vegetation trends are presented below, followed by a discussion of each EIA metric, suggestions for which metric scores may be improved at Lacamas Prairie, and recommendations for how those efforts may coincide with potential recovery actions for *Lomatium bradshawii*.

Ecological Integrity Assessment

Landscape Context

Landscape Context metrics were scored for the AA as a whole (not for individual sub-AAs).

L1. Contiguous Natural Land Cover

This metric serves as a proxy measure of the capacity for natural disturbances to occur on the landscape (e.g. fire). It also addresses the broader connectivity of the natural land cover by measuring the natural habitat that is directly contiguous to the AA (Rocchio et al., 2016). "Natural Land Cover" includes ruderal plant communities for the purposes of this metric. For complete definitions of land covers included within the "natural" definition, see Table 13 in Rocchio et al. (2016).

This metric did not change from 2016 to 2018. Of the area within 500 m of the AA, 45% has natural land cover and is contiguous to the AA (Table 7). Paved roads, pastures, and a water-ski pond ("Warman Lake") form the primary breaks in natural land cover (Figure 4).

Table 7. L1. Contiguous Natural Land Cover. This metric did not change between 2016 and 2018.

Area of Contiguous Natural Land Cover (ac)	Total Area (ac)	Percent Contiguous Natural Land Cover	EIA Metric Rating
150	335	45%	C

Figure 4. L1. Contiguous Natural Land Cover abutting the assessment area at Lacamas Prairie NAP. Natural Land Cover includes ruderal plant communities in this metric.

L2. Land Use Index

"Land use index" measures the intensity of human-dominated land use in the surrounding landscape, including optional submetrics for the inner zone (0–100 m) and outer zone (100–500 m) (Rocchio et al., 2016). The full AA scored on the low end of a "C" rating, with slight degradation from 2016 to 2018. The golf course across the road to the northeast was converted to suburban housing between 2016 and 2018, shifting it from "intensively developed vegetation" to "domestic, commercial, or publicly developed buildings and facilities (non-vegetated)". The remaining undeveloped land is either pasture or disturbed fallow land dominated by exotic species (Table 8, Figure 5, Figure 6). Note that areas to the northeast of sub-AA 2 (formerly known as the "Green Mountain Resort Mitigation Area") and southeast of sub-AA 1 are within NAP ownership, but were categorized as "recent old fields and other disturbed fallow lands" rather than "natural area / land managed for native vegetation". While these sectors contain scattered wet prairie species—and Natural Area staff are working to restore them to functional wet prairie plant communities—they remain almost completely dominated by exotic pasture grasses (*Phalaris arundinacea* and *Alopecurus pratensis*).

Table 8. L2. Land Use Index trends for the area surrounding Lacamas Prairie. Bold values are those that changed from 2016 to 2018.

		2016				2018			
Worksheet: Land Use Categories	Weight	Inner (0-100 m)		Outer (100-500 m)		Inner (0-100 m)		Outer (100-500 m)	
		% Area (0 to 1.0)	Score	% Area (0 to 1.0)	Score	% Area (0 to 1.0)	Score	% Area (0 to 1.0)	Score
Paved roads / parking lots	0			0.05	0.00			0.06	0.00
Domestic, commercial, or publicly developed buildings and facilities (non-vegetated)	0	0.19	0.00	**0.03**	**0.00**	0.19	0.00	**0.06**	**0.00**
Gravel pit / quarry / open pit / strip mining	0								
Unpaved roads (e.g., driveway, tractor trail, 4-wheel drive, logging roads)	1			0.01	0.01			0.01	0.01
Agriculture: tilled crop production	2								
Intensively developed vegetation (golf courses, lawns, etc.)	2	0.08	0.16	**0.17**	**0.34**	0.08	0.16	**0.12**	**0.24**
Vegetation conversion (chaining, cabling, roto-chopping, clearcut)	3								
Agriculture: permanent crop (vineyard, orchard, nursery, hayed pasture, etc.)	4			0.23	0.92			0.23	0.92
Intense recreation (ATV use / camping / popular fishing spot, etc.)	4								

		2016				2018			
Worksheet: Land Use Categories	Weight	Inner (0-100 m)		Outer (100-500 m)		Inner (0-100 m)		Outer (100-500 m)	
		% Area (0 to 1.0)	Score	% Area (0 to 1.0)	Score	% Area (0 to 1.0)	Score	% Area (0 to 1.0)	Score
Military training areas (armor, mechanized)	4								
Heavy grazing by livestock on pastures or native rangeland	4								
Heavy logging or tree removal (50-75% of trees > 30 cm DBH removed)	5								
Commercial tree plantations / holiday tree farms	5								
Recent old fields and other disturbed fallow lands dominated by ruderal and exotic species	5	0.47	2.35	0.28	1.40	0.47	2.35	0.28	1.40
Dam sites and flood disturbed shorelines around water storage reservoirs and motorized boating	5								
Moderate grazing of native grassland	6								
Moderate recreation (high-use trail)	7								
Mature old fields and other fallow lands with natural composition	7	0.04	0.28	0.08	0.56	0.04	0.28	0.08	0.56
Selective logging or tree removal (< 50% of trees > 30 cm DBH removed)	8								
Light grazing or haying of native rangeland	9								
Light recreation (low-use trail)	9								
Natural area / land managed for native vegetation	10	0.21	2.10	0.16	1.60	0.21	2.10	0.16	1.60
Total Land Use Score			4.89		4.83		4.89		4.73
A = ≥9.5, **B** = 8.0-9.4, **C** = 4.0-7.9, **D** = < 4.0 **Total Land Use Rating**			C		C		C		C
Combined Score (Inner score x 0.6)+(Outer Score X 0.4)		**4.87**		**C**		**4.83**		**C**	

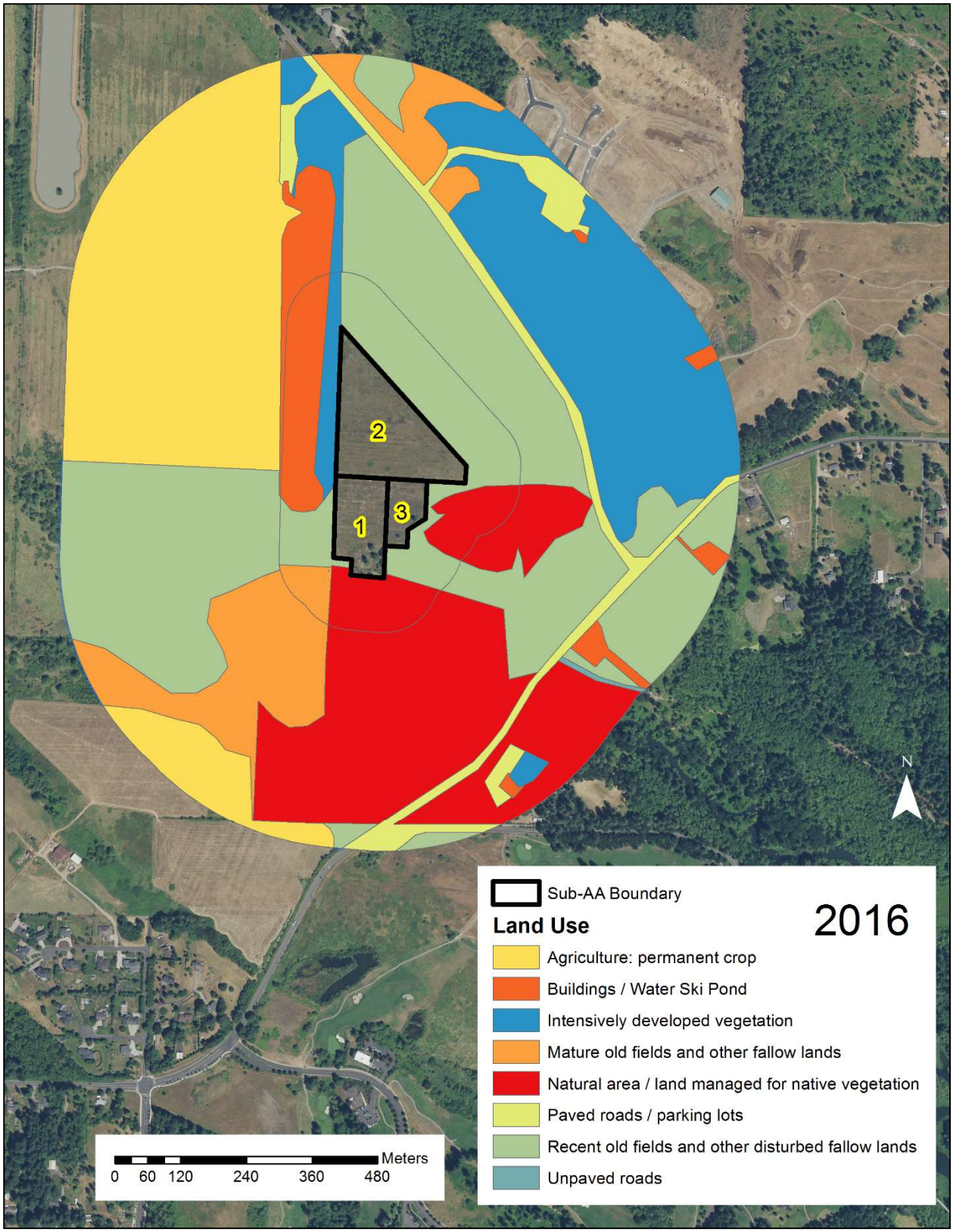

Figure 5. L2 (2016). Land Use Index categories within 500 m of the assessment area at Lacamas Prairie NAP in 2016. For this exercise, the artificial water-ski pond to the west was considered a "building".

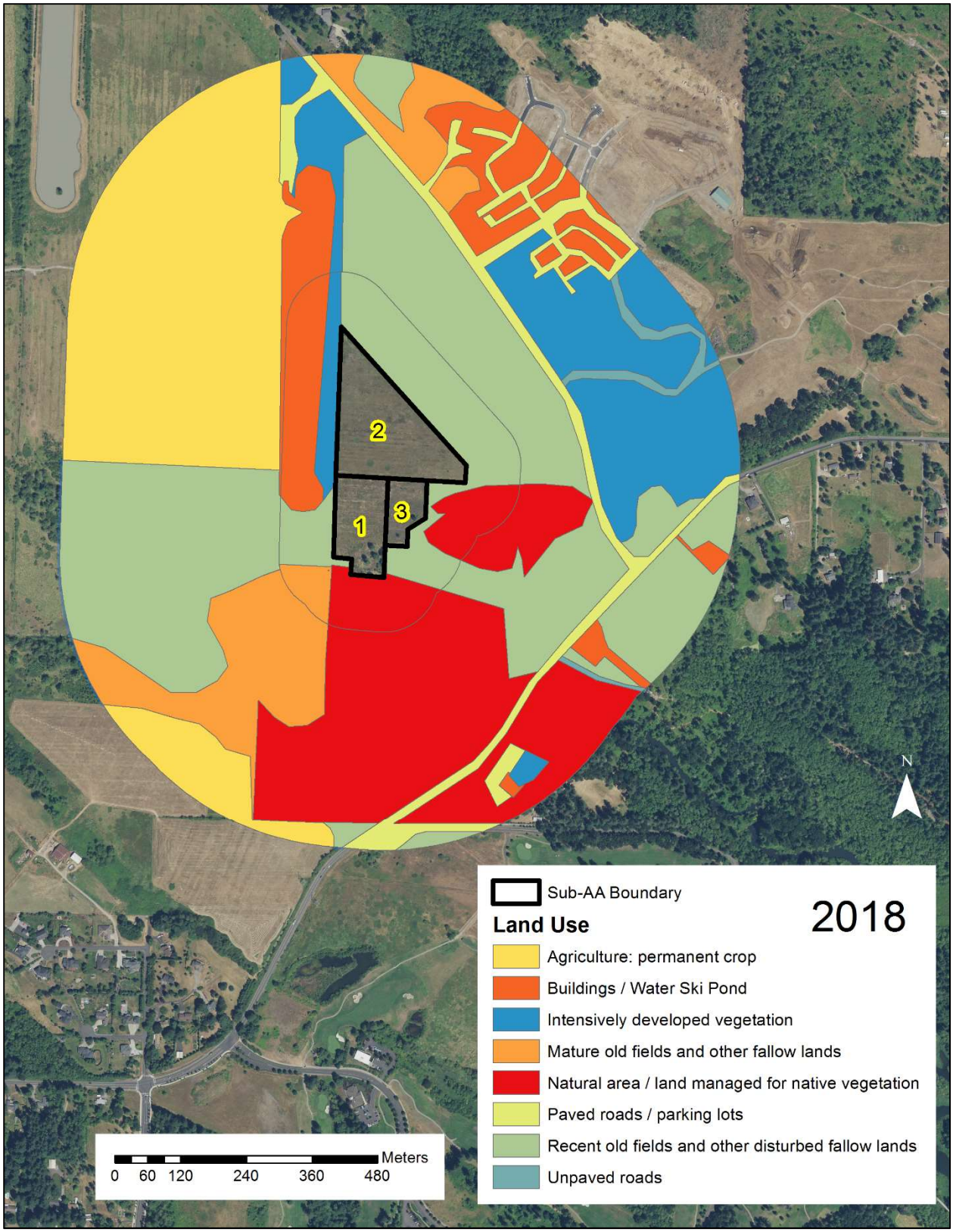

Figure 6. L2 (2018). Land Use Index categories within 500 m of the assessment area at Lacamas Prairie NAP in 2018. For this exercise, the artificial water-ski pond to the west was considered a "building".

B1. Perimeter with Natural Buffer

"Perimeter with natural buffer" is simply based on the percentage of the AA's perimeter with a natural buffer (Rocchio et al., 2016). Buffers serve important functions for both biotic and abiotic processes within the wetland. Less than half of the Lacamas Prairie AA perimeter is considered natural, primarily because the northeastern edge is a large ditch and the western edge abuts an artificial water-ski pond ("Warman Lake") (Figure 4, Table 9).

Table 9. B1. Perimeter with Natural Buffer

Perimeter with Natural Buffer (m)	Total Perimeter (m)	Percent of Perimeter with Natural Buffer	EIA Metric Rating
550	1225	45%	C

B2. Width of Natural Buffer

To measure "width of natural buffer", we created eight transects in ArcGIS extending from the center of the AA in each cardinal and subcardinal direction. We then measured how far beyond the edge of the AA each transect traveled before reaching unnatural land cover (up to 100 m) and averaged the resulting distances (Table 10).

Table 10. B2. Width of Natural Buffer

Transect	Buffer Width (up to 100 m)
1	0
2	0
3	0
4	100
5	100
6	100
7	100
8	0
Total	400
Average Buffer Width	50
EIA Metric Rating	C

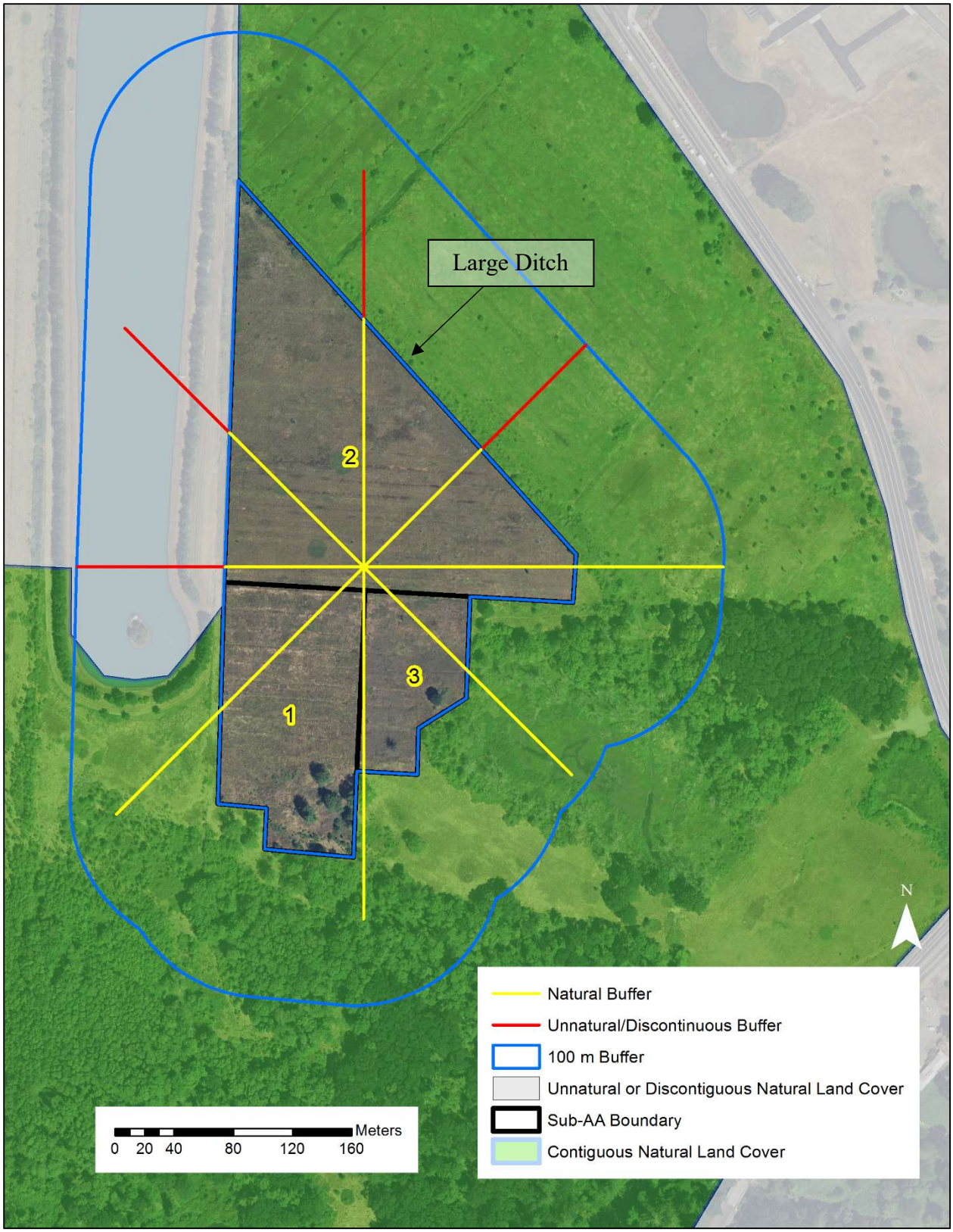

Figure 7. B2. Width of Natural Buffer. Landcover shifts to unnatural land cover—at least temporarily—where yellow transect turns to red.

B3. Condition of Natural Buffer

"Condition of natural buffer" is based on percent cover of native vegetation, soil disruption, indications of reduced water quality, amount of trash or refuse, various land uses, and the intensity of human visitation (Rocchio et al., 2016). The natural buffer surrounding the Lacamas Prairie AA has low cover of native vegetation (25-75%, primarily in the woodlands) and significant areas of disrupted soil from historic ditching, but little human visitation (Table 11). These traits matched the description for a "C" rating.

Table 11. B3. Condition of Natural Buffer

Metric Ratings	Natural Buffer Condition
Excellent (A)	Buffer is characterized by abundant (> 95%) cover of native vegetation, with intact soils, no evidence of loss in water quality, and little or no trash or refuse.
Good (B)	Buffer is characterized by substantial (75–95%) cover of native vegetation, intact or moderately disrupted soils, minor evidence of loss in water quality, moderate or lesser amounts of trash or refuse, and minor intensity of human visitation or recreation.
Fair (C)	Buffer is characterized by a low (25–75%) cover of native vegetation, barren ground and moderate to highly compacted or otherwise disrupted soils, strong evidence of loss in water quality, with moderate to strong or greater amounts of trash or refuse, and moderate or greater intensity of human visitation or recreation.
Poor (D)	Very low (< 25%) cover of native plants, dominant (> 75%) cover of nonnative plants, extensive barren ground and highly compacted or otherwise disrupted soils, moderate - great amounts of trash, moderate or greater intensity of human visitation or recreation, OR no buffer at all.

Condition

All condition metrics were assessed at the sub-AA scale to track progress of the degraded sub-AAs (1 and 3) towards the relatively high quality sub-AA (2). V5 (Woody Regeneration) and V6 (Coarse Woody Debris) metrics are used in forested or shrubland ecosystems and are optional in wet prairies. They were not scored for this project.

V1. Native Plant Species Cover

"Native plant species cover" evaluates the percent cover of native species relative to all species (Rocchio et al., 2016). Sub-AA 1 was first surveyed in the spring following a prescribed fire (plus herbicide and seeding/plugging) the previous fall. Overall cover was low the first year, with a relatively high percentage of natives (bolstered at least in part by plugs and seeding by Natural Areas staff) (Table 12, Figure 8). *Alopecurus pratensis* and other nonnatives bounced back the following year, however, and relative native cover continued to decline in 2018.

Table 12. V1. Native Plant Species Cover

Sub-AA	Year	Nonnative Cover Per Module (%)	Native Cover Per Module (%)	Relative Native Cover (%)	EIA Metric Rating
1 (n=4)	2016	12	30	71	C
	2017	52	49	48	D
	2018	65	42	39	D
2 (n=10)	2016	27	71	72	C
	2017	27	89	76	C
	2018	26	88	77	C
3 (n=5)	2016	97	19	16	D
	2017	35	44	56	D
	2018	63	40	39	D

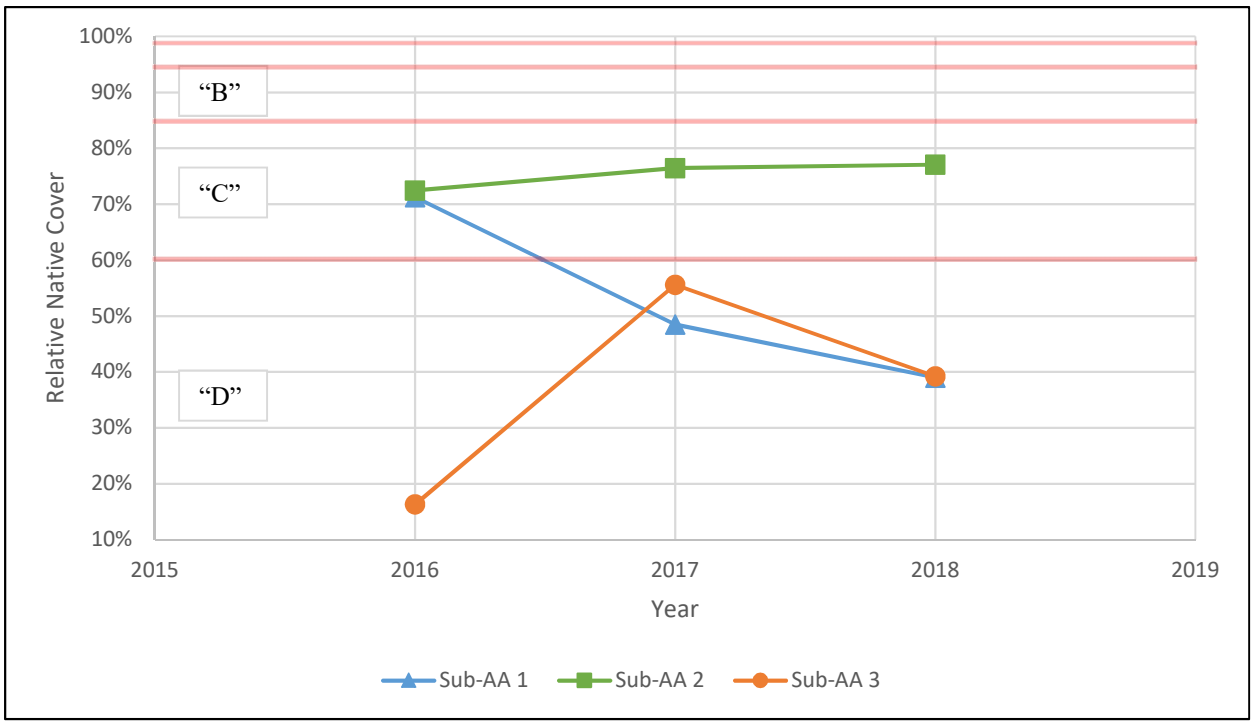

Figure 8. V1 (Relative Native Plant Cover) trends across sub-AAs. Red lines indicate cutoffs between EIA metric ratings (Not labeled: "A-" = 95-99%, "A" = > 99%).

Sub-AA 2, which received no treatments, remained relatively stable during the project period. Somewhat higher native cover in 2017 and 2018 may be the result of sampling occurring slightly later phenologically than in 2016. Several dominant native wet prairie species develop later in the year than common invasive species, such as annual bromes, so their relative cover may be understated when sampled earlier in the spring. Attempts were made to match the phenology of sampling events, but some degree of variation was inevitable.

Sub-AA 3 presents a before-and-after view of the effects of prescribed fire, herbicide, and subsequent seeding/plugging on native plant cover. Relative native cover jumped by 40 percentage points in the year after treatment, but fell by 17 points in the subsequent year.

V2. Invasive Nonnative Plant Species Cover

Invasive nonnative plant species cover evaluates the absolute cover of invasive species on site (Rocchio et al., 2016). The definition of invasive used here is more specific than just "exotic" or "nonnative". "Invasive" refers specifically to non-naturalized exotic plants that have negative ecological impacts (these species are also known as "transformers") (Richardson et al., 2000). Table 13 lists the exotic species found at Lacamas that were considered invasive for the purposes of this project. *Alopecurus pratensis* is by far the most abundant invasive at Lacamas Prairie, exceeding 75% cover in some areas of the AA. Invasive bentgrasses such as *Agrostis capillaris* and *Agrostis stolonifera* have been found at many other protected wet prairies (US Fish and Wildlife Service, 2010), but we did not observe any at Lacamas.

Table 13. Species considered invasive in wet prairie at Lacamas Prairie.

Species	Growth Form
Alopecurus pratensis	Graminoid
Anthoxanthum odoratum	Graminoid
Bromus commutatus	Graminoid
Cirsium arvense	Forb
Convolvulus arvensis	Forb
Crataegus monogyna var. *monogyna*	Shrub / Tree
Dipsacus fullonum	Forb
Holcus lanatus	Graminoid
Hypericum perforatum	Forb
Jacobaea vulgaris	Forb
Leucanthemum vulgare	Forb
Phalaris arundinacea	Graminoid
Poa compressa	Graminoid
Poa pratensis	Graminoid
Rubus bifrons	Shrub
Schedonorus arundinaceus	Graminoid
Trifolium subterraneum	Forb
Considered, but not used in invasive calculations	
Lythrum portula	Forb
Rumex acetosella	Forb

In Sub-AA 1, invasive cover mirrored the degradation in relative native cover (V1) in the years following the prescribed burn. Absolute invasive cover increased by 13 percentage points in 2017 and continued to spread in 2018, reaching 54% of the unit, an increase of 33 percentage points from 2016 (Table 14, Figure 9). *Alopecurus pratensis* alone accounted for 48% absolute cover in 2018, followed by *Poa pratensis* (5%) and *Holcus lanatus* (3%), but these are almost certainly still lower than pre-burn numbers (before this study started). Only trace amounts of *Phalaris arundinacea* were found in this sub-AA.

Table 14. V2. Invasive Nonnative Plant Species Cover. Note that this is an absolute measurement, not relative to total or native cover.

Sub-AA	Year	Invasive Cover Per Module (%)	EIA Metric Rating
1 (n=4)	2016	21	C-
	2017	44	D
	2018	54	D
2 (n=10)	2016	20	C-
	2017	16	C-
	2018	15	C-
3 (n=5)	2016	70	D
	2017	37	C-
	2018	40	D

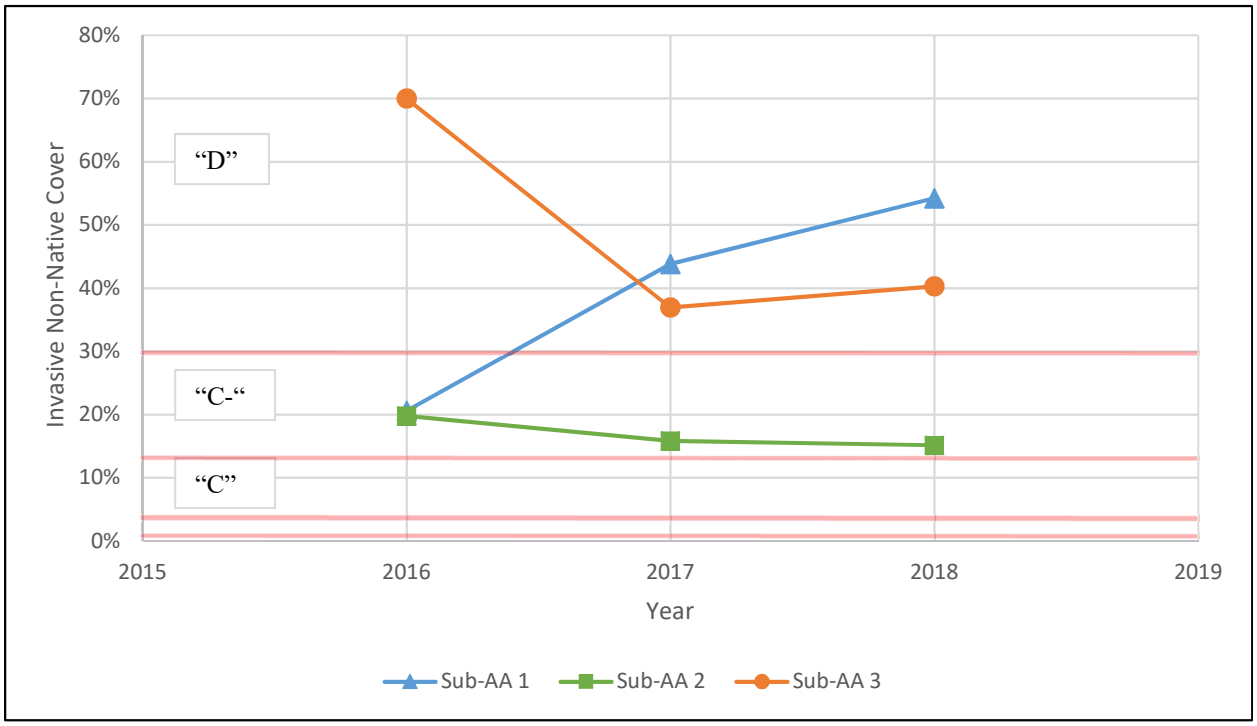

Figure 9. V2 (Invasive Nonnative Plant Species Cover) trends across sub-AAs. Note that this is an absolute measurement, not relative to total or native cover. Red line indicates the cutoff between EIA metric ratings (Not labeled: "B" = 1-4%, "A" = < 1%).

As with cover from native species, cover of invasive plants remained relatively stable in sub-AA 2. A slight decline brought overall invasive cover down to 15%. *Alopecurus pratensis* had the highest cover in 2018 (7%), followed by *Bromus commutatus* (5%) and *Holcus lanatus* (3%). Only small patches of *Phalaris arundinacea* (already noted by Natural Areas staff) were detected and are now being spot-treated.

Sub-AA 3 experienced a dramatic drop in cover by invasive species the year following the prescribed burn, declining by 33 percentage points. Invasive species increased very slightly (by three percentage points) in 2018. Future monitoring is required to determine if this trend will continue. The invasive species with highest cover in sub-AA 3 in 2018 were *Leucanthemum vulgare* (17%), *Alopecurus pratensis* (15%), and *Trifolium subterraneum* (3%). Note that *Trifolium subterraneum* was only first detected in 2018. *Lythrum portula*—an invasive more typical of mudflat communities—was found in sub-AA 3 in 2017 but was not relocated in 2018. Again, only trace amounts of *Phalaris arundinacea* were found in this sub-AA.

V3. Native Plant Species Composition

"Native plant species composition" is an assessment of overall species composition and diversity, including submetrics for native diagnostic species, native decreasers, and native increasers (e.g., "native invasives" of Richardson et al. (2000)) (Rocchio et al., 2016). Submetrics provide mental road maps for surveyors to follow when rating certain metrics, helping to ensure congruent thought processes between individuals and between sites. There is no prescribed formula for rolling up these submetrics into an overall metric rating. It is often appropriate to simply average them, but individual surveyors have discretion to assign a metric rating either higher or lower than the submetric average. For example, in 2016, sub-AA 3 received a "D" in diagnostic species (V3a), a "B" in native increasers (V3b), and a "C" in native decreasers (V3c). A straight average of these submetrics would result in a metric rating of "C". However, we felt the cover of diagnostic species was too poor to assign anything higher than a "D" overall.

Diagnostic species (V3a) are those native plant species whose relative constancy or abundance differentiates one vegetation type from another. This includes character species (strongly restricted to a type), differential species (higher constancy or abundance in a type as compared to others), constant species (typically found in a type, whether or not restricted), and dominant species (high abundance or cover) (Federal Geographic Data Committee, 2008; Rocchio et al., 2016). Sub-AAs 1 and 3 both exhibited small improvements in the cover of diagnostic species, particularly *Deschampsia cespitosa* and *Carex unilateralis* (Table 15, Figure 10). By 2018, these sub-AAs improved from "D" submetric ratings ("most or all native diagnostic species absent, a few may remain in very low abundance; diagnostic species may be so few as to make the type difficult to key") to "C" ratings ("many native diagnostic species absent or substantially reduced in abundance").

Sub-AA 2 held steady at an "A" rating in this submetric ("typical range and diversity of native diagnostic species present"), though it also experienced a nearly 8 percentage-point increase in *Deschampsia cespitosa* cover by 2018. It is possible that sampling at a slightly later phenological point in 2018 contributed to this increase. *D. cespitosa* becomes much more conspicuous after the inflorescence opens into a showy open panicle, which could influence cover estimations. In 2016, inflorescences were just beginning to unfurl, while in 2018, they were quite open. On the other hand, the increase in 2018 was consistent with an increase in 2017 (when the sampling phenology was a better match for 2016).

Table 15. V3. Native Plant Species Composition and component submetrics.

Sub-AA	Year	V3a. Diagnostic Species	V3b. Native Increasers	V3c. Native Decreasers	Overall
1	2016	D	B	C	C
	2017	D	C	C	C
	2018	C	B	C	C
2	2016	A	B	C	B
	2017	A	B	C	B
	2018	A	B	C	B
3	2016	D	B	C	D
	2017	D	C	C	D
	2018	C	B	C	C

Native increasers (V3b) are those native species whose dominance is indicative of degraded ecological conditions, such as heavily grazed occurrences (Daubenmire, 1968). These species typically have C-values ≤ 3. Native decreasers (V3c), meanwhile, are those species that decline rapidly due to stressors (often with C-values ≥ 7). Increasers can be difficult to score in wet prairies, where some of the characteristic dominant species (such as *Deschampsia cespitosa*) are stress-tolerant. Note, however, that presence alone is not sufficient evidence that a species is acting as an increaser. Instead, current abundance relative to expected abundance triggers such a designation.

All three sub-AAs ended up with "B" submetric ratings for native increasers by 2018 ("Native species indicative of anthropogenic disturbance are present with low cover or—if naturally common in this type—present in slightly greater than expected amounts and associated with conspicuous stressors"). Sub-AA 1 had a brief spike in increasers (primarily *Galium trifidum*) in 2017, two years after the prescribed burn, but it subsided in 2018. Note that it is possible for a sub-AA to score well in the native increasers submetric simply because the cover of exotic weeds is so great as to limit the cover of natives in general.

No native decreasers were found in any of the sub-AAs, so each received a "C" submetric rating ("No native species sensitive to anthropogenic degradation present"—this submetric is scored from "A" to "C").

With two exceptions, all sub-AAs were assigned overall metric ratings that matched the average of their submetric ratings. In 2016 and 2017, we felt diagnostic species cover at sub-AA 3 was too poor to assign anything higher than a "D" overall (the average of the submetrics was "C"). Additionally, increaser submetric ratings were somewhat discounted in sub-AAs 1 and 3, as it seemed likely the paucity of native increasers was because there were relatively few native species in general. Full species cover / frequency tables may be found in Appendix D.

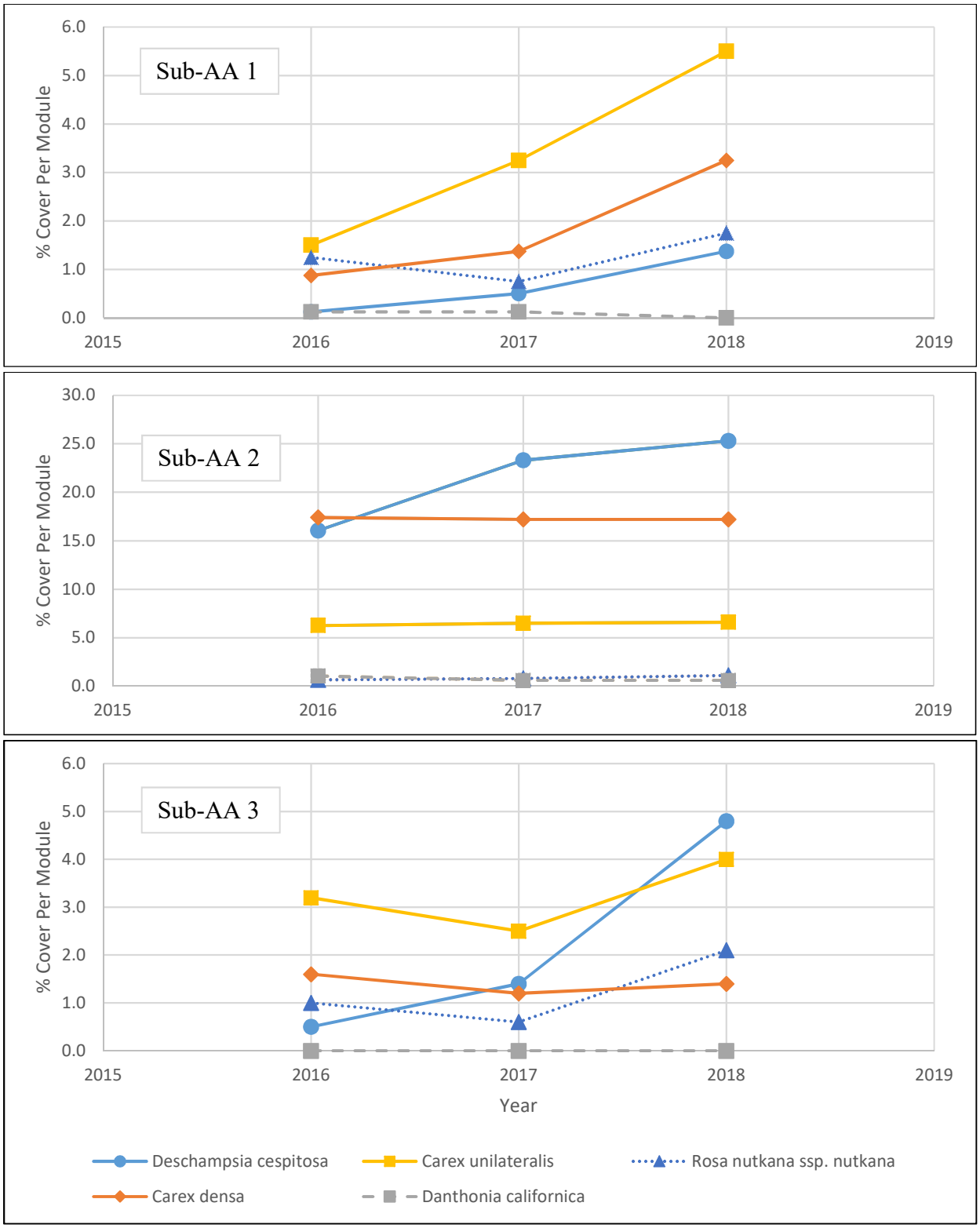

Figure 10. V3a (Diagnostic Species submetric of Native Plant Species Composition) trends across sub-AAs. Displays % cover of a selection of species that are diagnostic dominants in Willamette Valley Wet Prairie plant associations. Note that the scale for sub-AA 2 is different due to significantly higher cover.

V4. Vegetation Structure

This metric evaluates the horizontal and vertical structure of the vegetation relative to the reference condition of the dominant growth form's structural heterogeneity (Rocchio et al., 2016). In wet prairies, surveyors focus on the characteristic cespitose graminoid structure (with forbs in the interstitial space) and assess the degree of shrub encroachment. Wet prairies typically have small pedestals (i.e. tussocks) formed by dominant graminoids. These pedestals provide microtopographic variability and habitat for plant species requiring somewhat drier conditions. Low-lying areas between pedestals are frequently flooded in the winter and support obligate wetland perennials and/or small annuals that flourish in the summer (US Fish and Wildlife Service, 2010).

Sub-AA 1 was first evaluated in the spring immediately following a fall prescribed burn. At the time, vegetation structure was within the natural range of variation for a wet prairie that had just experienced a fire (i.e. lots of bare ground, but with resprouting bunchgrasses and forbs and numerous annuals). It was assigned a "B" metric rating (Table 16). In subsequent years, *Alopecurus pratensis* (a rhizomatous invasive) regained dominance. Sub-AA 3 followed a similar path, with a brief period of structural improvement immediately following the fire. Sub-AA 2 exhibits structure that is near historical conditions ("A" rating), with high cover of bunchgrasses and a diverse array of forbs growing in the low-lying interstitial spaces.

Table 16. V4. Vegetation Structure.

Sub-AA	Year	EIA Metric Rating
1	2016	B
	2017	C
	2018	C
2	2016	A
	2017	A
	2018	A
3	2016	C
	2017	B
	2018	C

Hydrology

Hydrology is assessed via three interrelated metrics: water source (H1), hydroperiod (H2), and hydrologic connectivity (H3). Unlike most EIA metrics, hydrology metrics rely largely on the cataloguing of stressors, rather than direct assessment of condition. Generally, EIA metrics are designed to assess *condition*, rather than the *stressors* that affect condition. For example, with other metrics, surveyors do not directly measure how many cattle have grazed an AA (the stressor), but instead assess the impacts that the grazing stressor has had on the condition of native plant cover (V1), vegetation structure (V4), etc. In a level 2 EIA, which is generally completed in a single site visit, it is simply not possible to assess the hydrologic *condition* of an AA. A true assessment of condition would require wells with loggers and/or periodic revisits. However, intact hydrology is key to the long-term survival of any wetland and cannot be ignored. To this end, surveyors look for hydrologic stressors and infer the impacts to the ecosystem.

H1. Water Source

The first of the hydrology metrics, water source (H1) evaluates the forms or places of direct inputs of water to the AA (or sub-AA), plus any unnatural diversions of water (Rocchio et al., 2016). One of the primary long-term concerns for Lacamas Prairie is the maintenance and restoration of natural hydrologic function. On- and off-site agricultural ditching and an increase in the area of impervious surfaces and channeling of runoff into stormwater systems in the surrounding watershed are significant stressors (Reynolds, 2004; Washington Natural Heritage Program, 2006). These stressors have impacted all three sub-AAs, but most water still comes from characteristically natural sources (precipitation perched on impermeable soil, some overland sheetflow, and episodic overbank flooding from Lacamas Creek), so each was given an overall metric rating of "C" Table 17, Figure 11).

Table 17. H1. Water Source.

Sub-AA	EIA Metric Rating
1	C
2	C
3	C

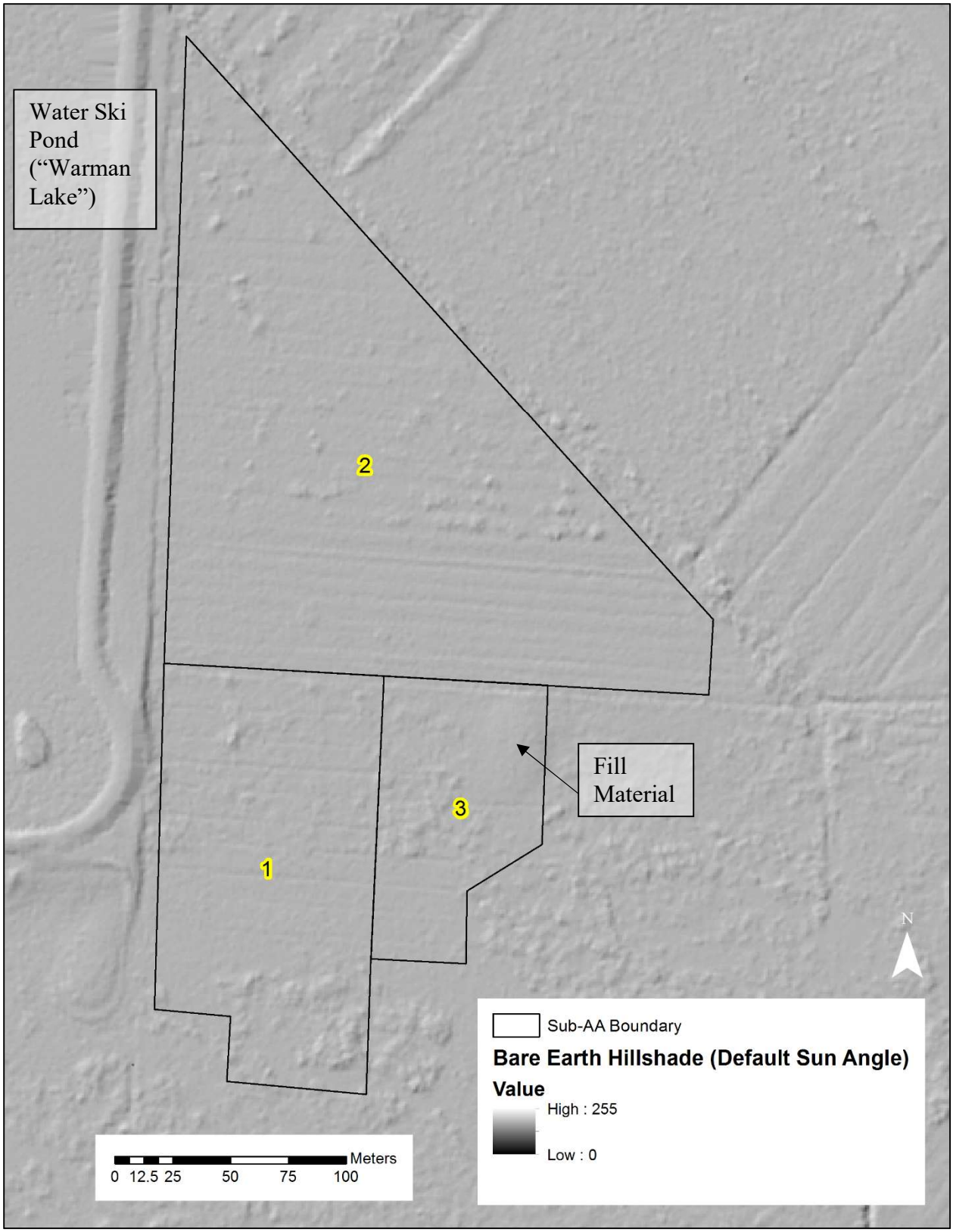

Figure 11. Bare earth hillshade of Lacamas Prairie NAP. Major ditches run along the northeastern boundary of sub-AA 2 as well as between 2 and sub-AAs 1 and 3. Minor ditches are visible running east-west.

H2. Hydroperiod

"Hydroperiod" assesses the frequency and duration of inundation or saturation in the wet prairie (Rocchio et al., 2016). Wet prairies are seasonally flooded systems, with water retreating below the soil surface prior to early summer. While Lacamas periodically receives floodwaters from the neighboring riverine system, it is primarily a depressional outflow wetland sustained by a perched water table and precipitation. Ditching in all three sub-AAs has resulted in some deviation from the natural pattern of inundation, drawdown, saturation, and seepage discharge. The distinct ditching pattern across the site results in an unnatural pattern of fine-scale water levels. The historical topographic patterns of the site are not known but presumably the pattern of low and high points on the site were different than today. However, current ditch management of the hydrologic regime at least approximates a natural analog, so all sub-AAs received a "C" rating (Table 18).

Table 18. H2. Hydroperiod.

Sub-AA	EIA Metric Rating
1	C
2	C
3	C

Figure 12 and Figure 13 illustrate the drawdown from March 26 to May 6, 2015 (D. Wilderman, unpublished data 2015), a notably dry winter/spring. Hydrologic logger data collected from November 2017 to June 2018 (a much wetter time period) indicate that sub-AA 2 has consistently higher water levels (by several inches) during the growing season compared to sub-AA 1 (D. Wilderman, unpublished data 2018). Sub-AA 2 was also inundated for about three weeks longer than sub-AA 1. No logger data exists for sub-AA 3, but that area appears to be drier still.

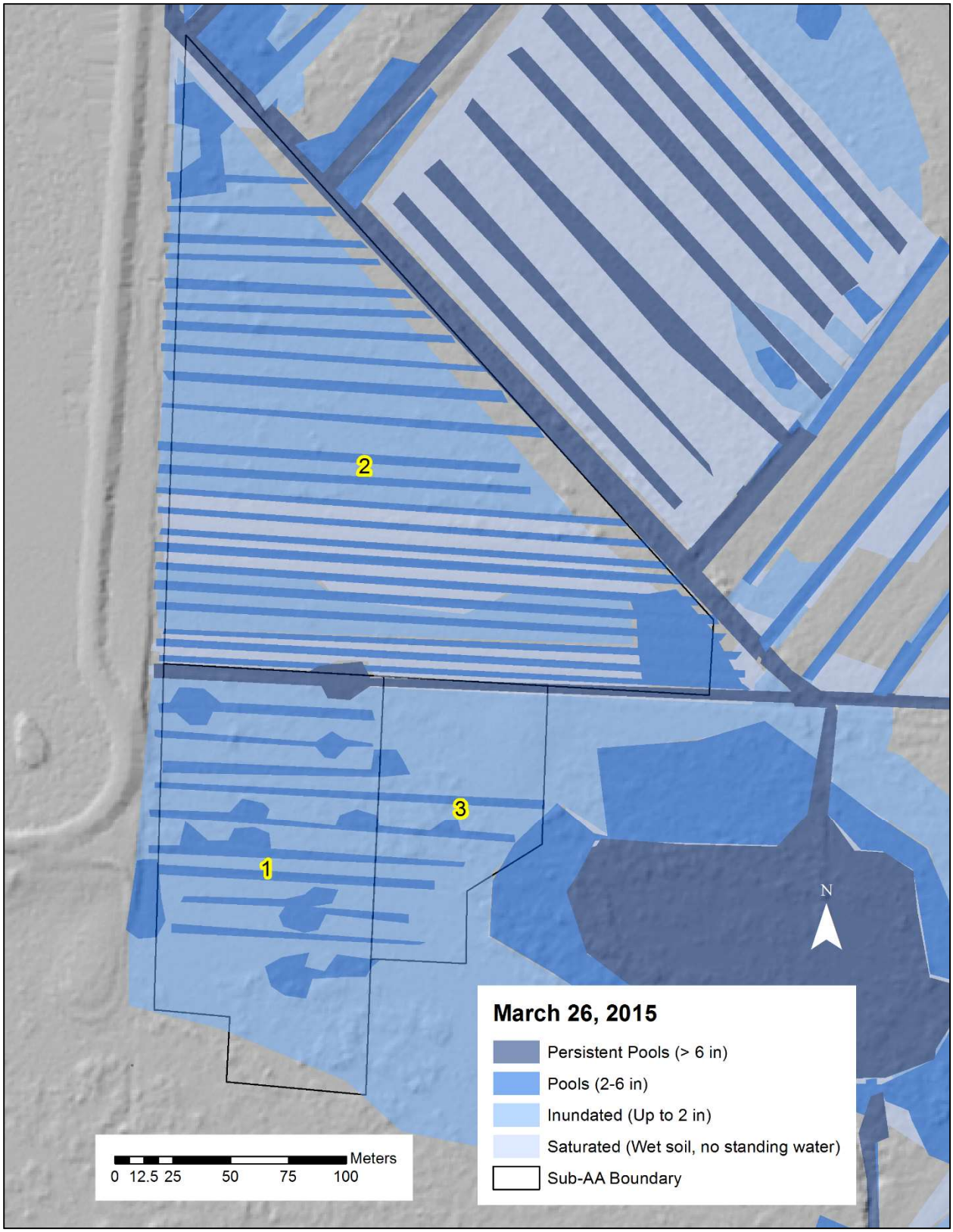

Figure 12. Water depths on Lacamas Prairie NAP, March 26, 2015.

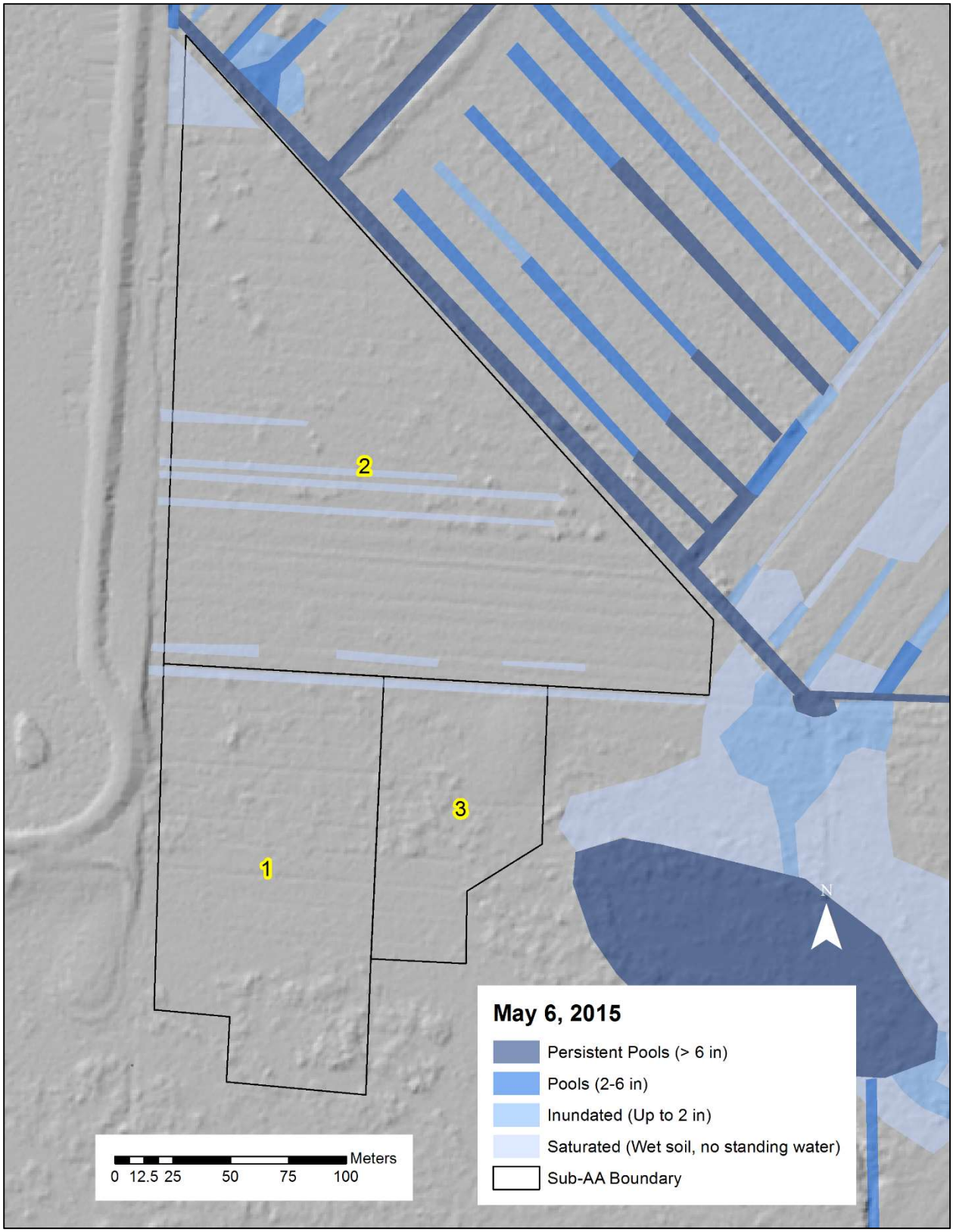

Figure 13. Water depths on Lacamas Prairie NAP, May 6, 2015.

H3. Hydrologic Connectivity

"Hydrologic connectivity" is closely related to hydroperiod, but measures the horizontal movement of water, rather than vertical movement—in other words, is water unrestricted from moving in and out of the wetland. At Lacamas, the combination of ditches and the berms formed by Warman Lake and a nearby road (primarily Goodwin Road) provide significant restrictions to the movement of water (Figure 14). With that said, floodwaters from Lacamas Creek are relatively unimpeded and still occasionally inundate the site. All sub-AAs received a "C" rating (Table 19).

Table 19. H3. Hydrologic Connectivity.

Sub-AA	EIA Metric Rating
1	C
2	C
3	C

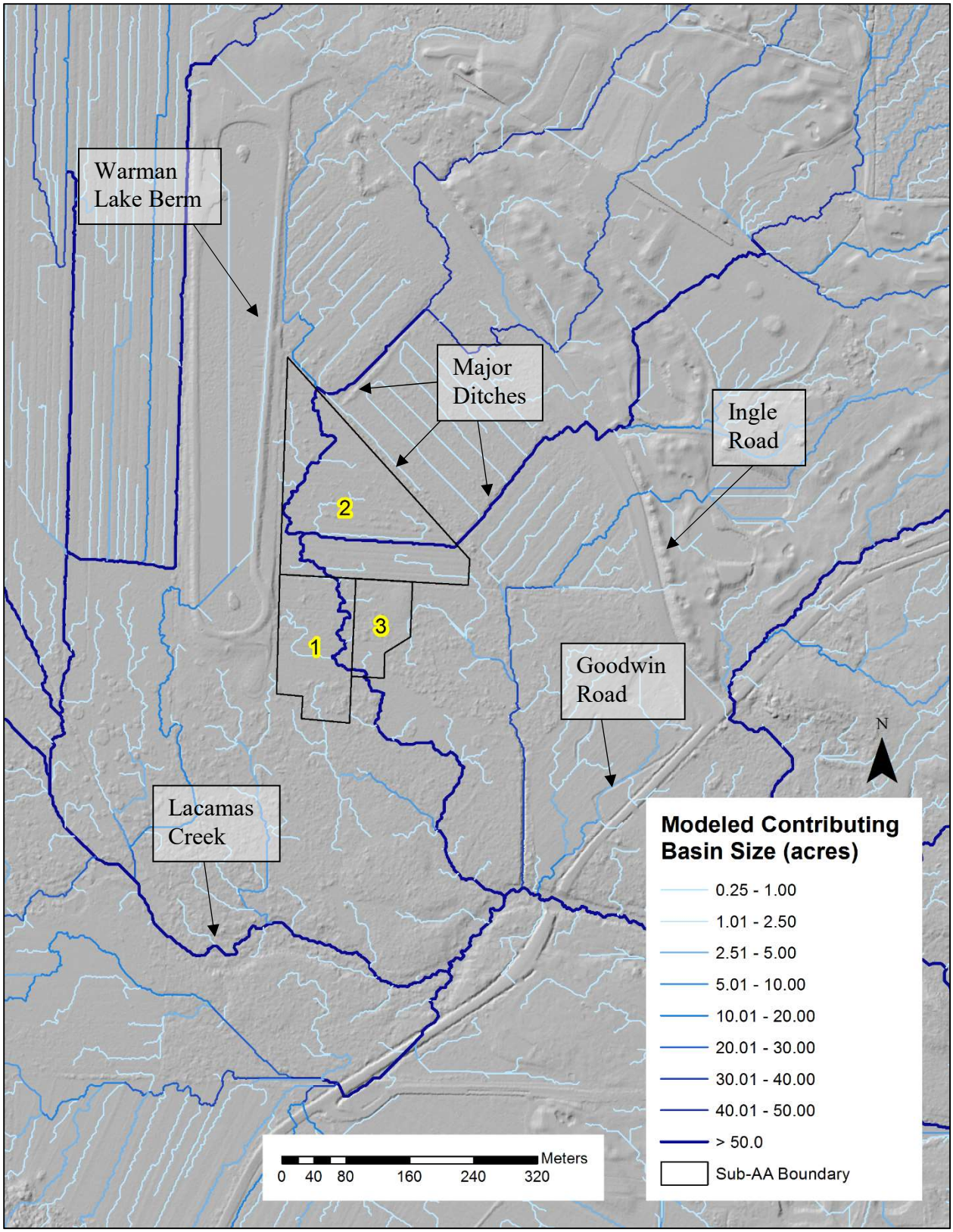

Figure 14. Modeled surface water flow at Lacamas Prairie NAP (Forest Informatics Section, 2018). Note that the model did not recognize the large ditch along the northeast boundary of sub-AA 2.

S1. Soil Condition

This metric uses stressors as indications of soil condition (Rocchio et al., 2016). Lacamas Prairie sits on very poorly drained, silty clay loam (NRCS Soil Survey Staff, 2011). The entirety of the prairie has endured soil disturbance from ditching and there may be compaction from past grazing. However, the impermeable/slowly permeable clay layer that maintains the perched water table appears to be intact. The overall impact of disturbance appears to be moderate and all sub-AAs received a "C" rating (Table 20).

Table 20. S1. Soil Condition.

Sub-AA	EIA Metric Rating
1	C
2	C
3	C

Size

The size metric was scored for the AA as a whole (not for individual sub-AAs).

Z1 Comparative Size

"Comparative size" assesses the current size of the wetland relative to the historic spatial pattern for that wetland type. Within Washington State, wet prairies historically occurred in small patches of ~1 to > 25 acres, but larger stands were likely present. The area currently supporting wet prairie plant associations at Lacamas is approximately 15 acres, good for a "B" rating (Table 21). An additional rating for "Change in Size" (Z2) may be used when the historical extent of the assessed ecosystem occurrence is known, but we were unable to score this metric at Lacamas.

Table 21. Z1 Comparative Size: Area by spatial pattern of type. Lacamas Prairie received a "B" in this metric.

Metric Rating	*Comparative Size By Patch Type (acres)*					
Spatial Pattern Type	Large Patch (ac) (none in WA)	Medium-Small Patch (ac) (salt marsh, intertidal)	Small Patch (ac) (forested/shrub swamp, greasewood flat; marsh/meadow, peatland, aquatic bed, playa, interdunal, mudflat, and eelgrass)	Very Small Patch (m^2) (seep/spring, horizontal wet sparse, vernal pool)	Very Small Patch (m) (vertical wet sparse)	Linear (length in km) (riparian)
Excellent (A)	> 300	> 125	> 25	> 300 m^2	> 20 m high	> 3 mi
Good (B)	60-300	25-125	5-25	200-300 m^2	10-20 m high	0.6-3 mi
Fair (C)	12-60	5-25	1-5	100-200 m^2	5-10 m high	0.06-0.6 mi
Poor (D)	< 12	< 5	1	< 100 m^2	< 5 m high	< 0.06 mi

Roll-Up

Rolled up EIA Scores and Ranks are presented in Table 22. Note that Landscape Context was scored for the entire AA (not individual sub-AAs). Sub-AA 1 showed a small decline in ecological integrity from 2016 to 2018, falling from a C+ to a C-. Sub-AA 2 held steady with a C+ EIA Rank and was only 0.02 points below the cutoff for a B- Condition Rank. Sub-AA 3 improved slightly, but stayed within the range for a C- EIA Rank. The full AA settled out to a C+ score overall in 2016-2018. Condition scores for the full AA were integrated based on each sub-AA's proportion of the total area. Full tables of EIA results (including EO Ranks that factor in the Size metric) may be found in Appendix B.

Table 22. EIA Ranks for each sub-AA (and the full AA) at Lacamas Prairie NAP. EIA Score / Rank weights Condition 70% and Landscape Context 30%. EORANK integrates size, but is not appropriate for use with individual sub-AAs.

Sub-AA	Year	Landscape Context Score	Condition Score	Landscape Context Rank	Condition Rank	EIA Score	EIA Rank
1	2016	2.00	2.07	C	C	2.05	C+
1	2017	2.00	1.73	C	C	1.81	C-
1	2018	2.00	1.73	C	C	1.81	C-
2	2016	2.00	2.48	C	C	2.34	C+
2	2017	2.00	2.48	C	C	2.34	C+
2	2018	2.00	2.48	C	C	2.34	C+
3	2016	2.00	1.59	C	C	1.71	C-
3	2017	2.00	1.73	C	C	1.81	C-
3	2018	2.00	1.73	C	C	1.81	C-
FULL AA	2016	2.00	2.26	C	C	2.18	C+
FULL AA	2017	2.00	2.19	C	C	2.13	C+
FULL AA	2018	2.00	2.19	C	C	2.13	C+

Vegetation Data

A full species list may be found in Appendix C. Trends in cover and frequency of each species are presented in Appendix D. One data sheet from sub-AA 1 was lost or destroyed in 2018, so only four modules were used for calculation of trends in that sub-AA. As a result, the 2016 and 2017 data from that module were used only for tabulation of the final AA-wide species list (Appendix C). Unfortunately, the loss of this data sheet significantly reduced the statistical power for sub-AA 1.

Cover and Frequency

This project established permanent plots for use with ongoing monitoring of treatment units at Lacamas Prairie. Table 23 presents statistically significant cover changes ($p \leq 0.05$) between 2016 and 2018. *Alopecurus pratensis* was the only exotic plant with a statistically significant change in cover. *A. pratensis* increased in sub-AA 1 in the years following the burn, while decreasing in sub-

AA 3. Native *Carex unilateralis, Plagiobothrys figuratus, Galium trifidum*, *Deschampsia cespitosa*, and *Prunella vulgaris* all increased significantly over the project timeframe.

Table 23. Statistically significant changes in cover ($p \leq 0.05$) for each sub-AA at Lacamas Prairie NAP from 2016-2018 (minimum change = 1 percentage point). **Bold** = nonnative. ***** = invasive

Species	Percentage Points Δ	*p*-value
Sub-AA 1 (Burned Fall 2015)		
Carex unilateralis	+4.0	0.01
Alopecurus pratensis*	+40.0	0.05
Sub-AA 2 (High Quality)		
Galium trifidum	+12.3	0.04
Sub-AA 3 (Burned Fall 2016)		
Alopecurus pratensis*	-46.4	0.02
Plagiobothrys figuratus	+4.2	0.04
Deschampsia cespitosa	+4.3	0.05
Full AA		
Plagiobothrys figuratus	+1.9	0.01
Galium trifidum	+8.6	0.01
Carex unilateralis	+1.2	0.02
Deschampsia cespitosa	+6.3	0.02
Prunella vulgaris var. lanceolata	+1.2	0.04

More than half of the species with statistically significant changes in frequency were nonnative (Table 24). *Poa pratensis* frequency increased 75 percentage points between 2016 and 2018 in sub-AA 1, as exotic grasses invaded or re-invaded after the burn. *Bromus commutatus* frequency dropped 60 points in that timeframe in sub-AA 3. Across the full AA, several nonnative species increased in frequency, but the only statistically significant change in an *invasive* species was *Jacobaea vulgaris*, which dropped by 37 percentage points. The most notable change in native species frequency occurred with *Deschampsia cespitosa*. The wet prairie diagnostic increased its frequency by 70 percentage points in sub-AA 3.

Table 24. Statistically significant changes in frequency ($p \leq 0.05$) for each sub-AA at Lacamas Prairie NAP from 2016-2018 (minimum change = 1 percentage point). **Bold** = nonnative.

Species	Quadrat Size (m^2)	2016-2018 (Percentage Point Δ)
Sub-AA 1 (Burned Fall 2015)		
Poa pratensis	10.0	+75
Sub-AA 2		
None	--	--
Sub-AA 3 (Burned Fall 2016)		
Bromus commutatus	1.0	-60
Deschampsia cespitosa	10.0	+70
Myosotis laxa	1.0	+60
Full AA		
Cerastium fontanum ssp. vulgare	100.0	+37
Deschampsia cespitosa	10.0	+34
Epilobium ciliatum	1.0	+3
Madia sativa	100.0	+47
Montia linearis	100.0	+37
Bellardia viscosa	100.0	+47
Jacobaea vulgaris	100.0	-37
Trifolium repens	100.0	+11
Veronica serpyllifolia var. serpyllifolia	100.0	+42

Additional tables with cover and frequency values for all analyzed species may be found in Appendix D. These tables also show changes between 2016-2017 and 2017-2018.

Floristic Quality Assessment

Unweighted FQA indices generally show sub-AAs 1 and 2 holding steady or declining very slightly, with Sub-AA 3 marginally improving (Table 25). There is very little separation between sub-AAs in any of the unweighted indices.

Table 25. Selected Floristic Quality Assessment indices for each sub-AA and year at Lacamas Prairie NAP.

	Sub-AA 1 (Burned Fall 2015)			Sub-AA 2 (High Quality)			Sub-AA 3 (Burned Fall 2016)		
Year	2016	2017	2018	2016	2017	2018	2016	2017	2018
Mean C (Native)	3.66	3.46	3.60	3.40	3.49	3.40	3.13	3.41	3.34
Cover-weighted Mean C (Native)	3.50	3.36	3.75	4.11	4.05	4.12	3.73	4.48	3.76
Mean C (All)	2.25	1.99	1.94	2.04	2.03	2.00	1.71	1.99	1.85
Cover-weighted Mean C (All)	2.47	1.61	1.45	2.97	3.09	3.16	0.60	2.46	1.45
Mean C (Native Trees)	--	2.00	2.50	2.50	3.00	3.00	2.50	3.00	2.50
Mean C (Native Shrubs)	4.00	3.50	4.00	3.67	3.67	3.50	3.50	3.50	3.33
Mean C (Native Herbs)	3.65	3.50	3.66	3.43	3.51	3.42	3.15	3.44	3.38
FQAI (Native)	20.68	22.16	21.30	22.81	22.87	22.26	17.16	23.15	22.90
Cover-weighted FQAI (Native)	19.81	20.98	22.18	27.58	26.59	27.00	20.44	30.37	25.76
FQAI (All)	16.22	16.85	15.63	17.67	17.44	17.09	12.67	17.66	17.03
Cover-weighted FQAI (All)	17.82	13.26	11.66	25.69	26.60	27.02	4.47	21.82	13.34
Adjusted FQAI	28.68	26.12	26.42	26.34	26.59	26.06	23.14	26.04	24.84
Cover-weighted Adjusted FQAI	27.47	25.44	27.51	31.85	30.91	31.61	27.56	34.17	27.94
Species Richness (Native)	32	41	35	45	43	43	30	46	47
# Species With Moderate Fidelity To Prairies	8	13	14	16	17	18	6	14	16
# Species With High Fidelity To Prairies	11	12	9	10	11	11	7	14	12

Factoring in cover values tells a different story: Cover-weighted mean C (and other indices) declined substantially in sub-AA 1, improved slightly in sub-AA 2, and improved substantially in sub-AA 3 (Table 25, Figure 15). However, these cover-weighted indices end up as proxy measures of relative native plant cover at Lacamas—when the C-values of only native plants are assessed, the changes are much less apparent (Figure 16).

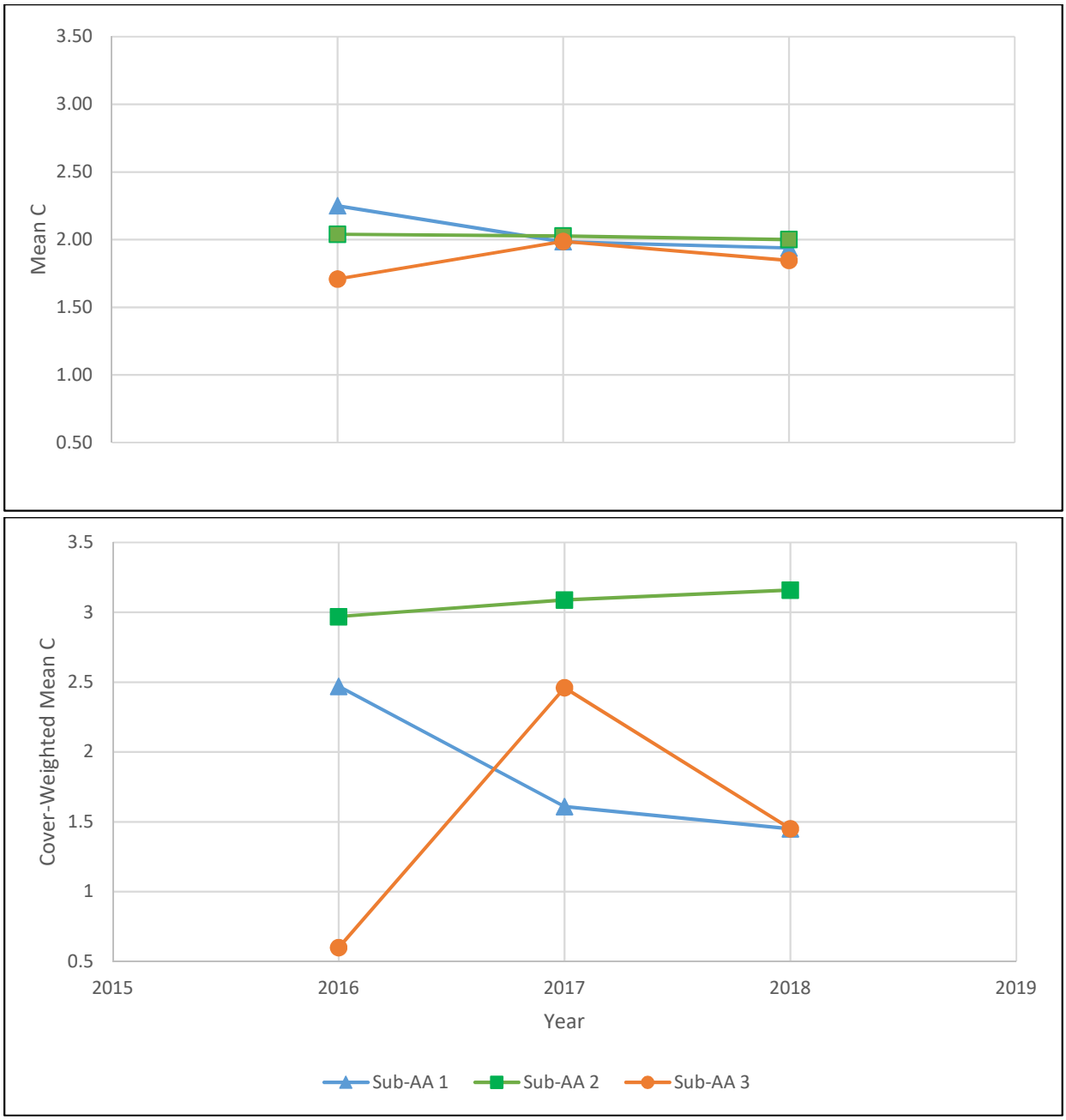

Figure 15. Short-term trends in Mean C and Cover-Weighted Mean C at Lacamas Prairie NAP.

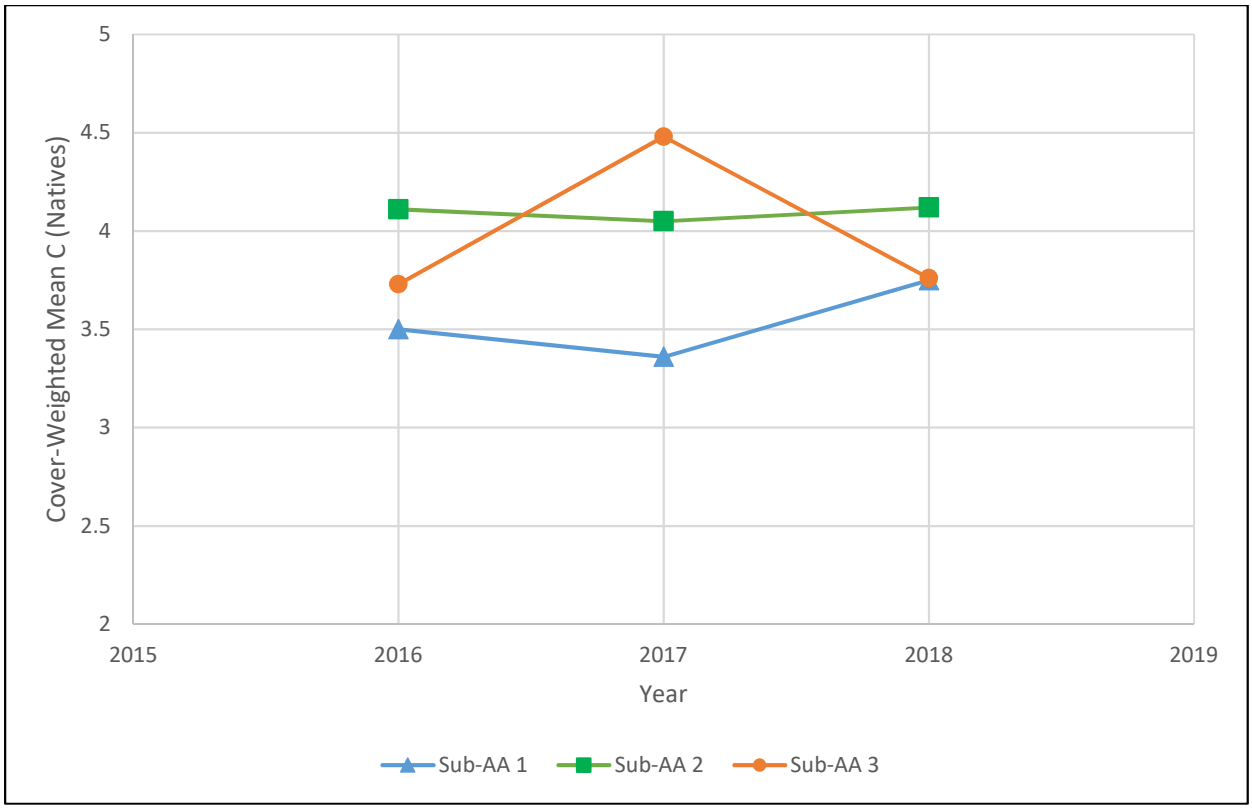

Figure 16. Short-term trends in Cover-Weighted Mean C of native species at Lacamas Prairie NAP.

The number of species with moderate or high fidelity to prairies increased in all three sub-AAs over the course of the project (Figure 17). The increase was particularly notable in sub-AA 3. Full FQA results may be found in Appendix E.

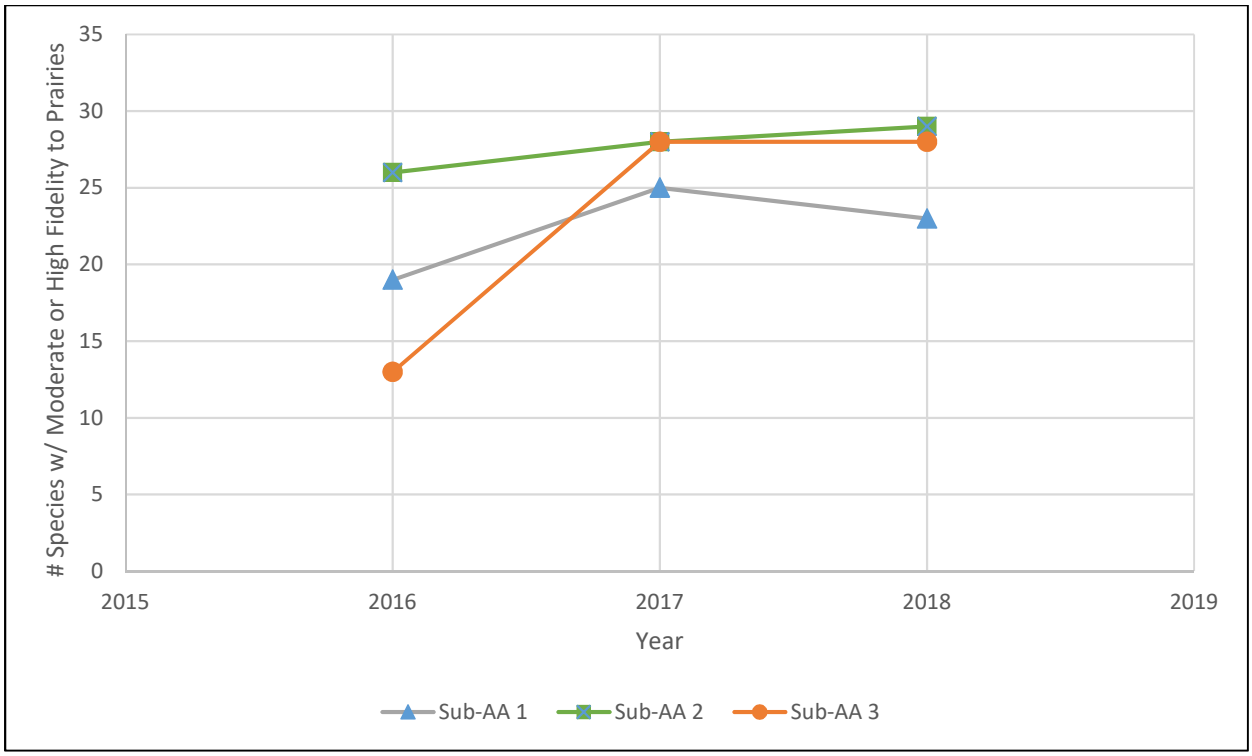

Figure 17. Short term trends in number of species with moderate or high fidelity to prairies (Chappell et al., 2004; Alverson, 2009).

Discussion / Recommendations

We found that treatments at Lacamas Prairie NAP intended to benefit *Lomatium bradshawii* are largely complementary to the condition of the wet prairie plant associations in which the species occurs. This project also demonstrated that EIA may be a beneficial tool for assessing the impacts of stressors on the condition of a wet prairie (or any ecosystem) and monitoring restoration and recovery efforts.

Ecological Integrity Assessment & Recovery Actions for *Lomatium bradshawii*

In this section, we step through the EIA metrics and examine the ecological processes they are assessing. We also discuss potential recovery actions for *Lomatium bradshawii*, the EIA metrics that are relevant to those actions, and which EIA metric scores may be improved at Lacamas Prairie (Table 26).

Table 26. Recovery actions related to the selection, protection, and management of *Lomatium bradshawii* population sites (Recovery Actions, Section 1.2.3 in US Fish and Wildlife Service (2010)) and relevant EIA metrics for monitoring those efforts.

Relevant Recovery Actions	Recommended EIA Metrics
1.2.3 Select, protect, and manage population sites	
1.2.3.1 Select populations on which to focus recovery actions Populations will be selected based on factors including, but not limited to… surrounding land uses,…security of sites from vandalism and disturbance, and availability of adequate contiguous habitat to provide for population expansion, natural recruitment, and possible augmentation of the population.	Contiguous Natural Land Cover (L1) Land Use Index (L2) Perimeter with Natural Buffer (B1) Width of Natural Buffer (B2) Condition of Natural Buffer (B3)
1.2.3.5 Manage populations to address threats and increase populations	
1.2.3.5.1 Manage population sites to set back woody plant invasion and reduce competition from non-native plants	
1.2.3.5.1.1 Prescribed fire Controlled burns are a common management tool for maintaining open grassland habitats.	Native Plant Species Cover (V1) Invasive Nonnative Plant Species Cover (V2) Native Plant Species Composition (V3) Vegetation Structure (V4)
1.2.3.5.1.2 Mowing As with other management techniques, the use of mowing … will need to be evaluated on a site-by-site basis. Land managers will need to assess the quantity and identity of nonnative plants at the site that may respond positively to this technique.	Native Plant Species Cover (V1) Invasive Nonnative Plant Species Cover (V2) Native Plant Species Composition (V3) Vegetation Structure (V4)
1.2.3.5.1.3 Remove woody plants [Prairie species] generally require open, unshaded habitat.	Vegetation Structure (V4)
1.2.3.5.1.4 Eliminate non-native plants to extent practicable and restore native prairie species. Although the total elimination of invasive non-native plants is unlikely, these alien species can be controlled through the careful and	Native Plant Species Cover (V1) Invasive Nonnative Plant Species Cover (V2) Native Plant Species Composition (V3)

Relevant Recovery Actions		Recommended EIA Metrics
	appropriate application of herbicides or mechanical control methods…Sites should be replanted with common native prairie species.	
1.2.3.5.2 Restore connectivity among populations. Restoring connectivity may be achieved by increasing the geographic extent of existing populations through appropriate habitat management and population augmentation, or may require the reintroduction of intervening populations between two more remote existing populations.		Contiguous Natural Land Cover (L1) Land Use Index (L2) Perimeter with Natural Buffer (B1) Width of Natural Buffer (B2) Condition of Natural Buffer (B3) Size (S1)

Landscape Context

L1 Contiguous Natural Land Cover

L2 Land Use Index

Prairies (wet and dry variants combined) once occupied as much as 30% of Willamette Valley bottom land, as well as a sizeable portion of the valley bottoms of southwestern Washington (Altman et al., 2001). These areas have been the locus of development pressure over the past 150+ years and remaining prairie patches generally occur amid intense human land use, with decreased connectivity and severely diminished capacities for natural disturbance. Lacamas Prairie is no exception. Pasture, paved roads, suburban housing development, a golf course, and even a water-ski pond ("Warman Lake") break up the natural land cover around the prairie. Much of the "natural" land cover remaining around the AA is fallow land dominated by *Phalaris arundinacea*, *Rubus bifrons*, and other invasive species. However, these degraded areas still serve as hydrologic and "human interest" buffers (Reynolds, 2004).

While the proportion of natural land cover contiguous to the AA (L1) remained steady at 45% during the brief period of this project, the intensity of human land use (L2) increased. The golf course across the road to the northeast was converted to domestic buildings—a relatively irreversible shift in land cover. Besides eliminating potential habitat restoration opportunities in the future, residential smoke concerns may make prescribed burning on the prairie more complicated. Additionally, increased impervious surface area and storm drains associated with development can impact the hydrology of the prairie (Meinke, 1982; Gisler, 2004; US Fish and Wildlife Service, 2010). Note that the change in land use was not large enough to change the metric rating during scoring of the EIA.

There are opportunities for improvement in these metrics. Further acquisition of parcels within the natural area boundary (or partnerships with current landowners) should be a priority, particularly to the west and northwest. While restoration to functional wet prairie ecosystems may prove difficult, these areas could at least be converted from pasture to more natural land cover. The area directly west of the current NAP also holds a large population of *Lomatium bradshawii*. More generally, expanding the size of the NAP coincides with prairie species recovery actions to ameliorate fragmentation and isolation and to move additional populations into protected status (US Fish and Wildlife Service, 2010).

B1. Perimeter with Natural Buffer

B2. Width of Natural Buffer

Improvements in the perimeter with natural buffer (B1) and width of natural buffer (B2) would be more difficult. The deep ditch that makes up the northern border of the highest quality portion of prairie (sub-AA 2) is used to help manage and simulate a natural hydrologic regime at the site.

Removal (filling) of this ditch could actually be counterproductive. Restoration of Warman Lake on the western border—should acquisition or an agreement with the current owner ever occur—does not appear practical.

B3. Condition of Natural Buffer
The natural buffer that remains around the AA at Lacamas Prairie is generally dominated by *Phalaris arundinacea* and *Alopecurus pratensis*. Much of the buffer has experienced even more intensive ditching and soil disturbance than the AA itself. Areas of *Quercus garryana* - (*Fraxinus latifolia*) / *Symphoricarpos albus* Riparian Forest within the buffer are in better condition, but still host a significant invasive component in the understory.

Ditch blockage and other hydrologic restoration efforts were undertaken in the pastureland areas in the late 1990s, improving onsite hydroperiod and connectivity with the core prairie. Within the current NAP, Natural Areas staff have begun using prescribed fire, herbicide, and seeding to improve the condition of the buffer. Staff have made headway in reduction of *Alopecurus*, but the *Phalaris* is notoriously resilient. Even if these areas cannot be successfully restored to functional wet prairie ecosystems, an increase in the proportion of native species in the buffer would help defend the core prairie area (and the *Lomatium bradshawii* population) against further invasions of exotic species. Additionally, the area to the northeast of the AA is directly upslope from the core prairie and is interconnected hydrologically

Condition
V1. Native Plant Species Cover
V2. Invasive Nonnative Plant Species Cover
Restoration efforts in sub-AA 3 have improved, at least temporarily, the relative native plant species cover (V1) and absolute invasive cover (V2). This improvement probably occurred in sub-AA 1, as well, though we do not have "before" data from that unit because the prescribed burn took place before this project started. Data further removed from the time of the burn is less encouraging, with sub-AA 1 (3 years post-fire) and sub-AA 3 (2 years post-fire) dropping back to only 39% relative native cover in 2018, good for a "D" metric rating. Both units ended with "D" ratings in absolute invasive cover as well, with brief bumps to "C-" in the year immediately following a burn.

Sub-AA 2 held steady with a "C" in relative native plant cover and a "C-" for invasive species. This relatively high quality sub-AA follows a pattern reported in other disturbed wet prairies, with greater cover from wetland-associated native plants in the shallow ditches crossing the prairie and greater cover from invasive grasses on the high ground in-between (Hanson, 2001).

Unsurprisingly, invasive species have been identified as a primary threat for *Lomatium bradshawii* (US Fish and Wildlife Service, 2010). The *Lomatium* population is known to respond positively to disturbance, particularly low intensity fire, which is also used to control invasive species. Pendergrass et al. (1999) showed that increased density and abundance of reproductive plants after burning subsided after 1-3 years, however, suggesting that burning must be quite frequent to sustain population growth (Kaye, 1992; Caswell & Kaye, 2001). Again, restoration for the rare plant and the wet prairie plant associations appear to be compatible, with burning for the *Lomatium* also improving the integrity of the wet prairie. It is important, however, that post-fire herbicide applicators take care to avoid keystone graminoid species like *Deschampsia cespitosa* when targeting invasive grasses.

Table 27 crosswalks the recovery plan's prairie quality native/nonnative criteria with the equivalent EIA metric and rating, along with the ratings assigned to each sub-AA at Lacamas Prairie. These target criteria have been suggested for evaluation of prairie quality at sites managed for recovery of *Lomatium bradshawii* and other prairie species (US Fish and Wildlife Service, 2010). The minimum target for "cover of native vegetation" is 50% relative cover, which would still be a "D" in Native Plant Species Cover (V1). Sub-AA 2 meets that criterion, while the other two sub-AAs do not. In this case, the EIA sets a higher bar for relative native cover. "Nonnative vegetation" in the recovery plan sets a minimum goal of <5 % absolute cover of total invasives and <50% cover for any single exotic species. This is equivalent to a "B" EIA metric rating (1-4% cover of invasives). None of the sub-AAs at Lacamas met the recovery plan standard, as *Alopecurus pratensis* exceeded 5% cover everywhere (though it was only 7% in sub-AA 2). Note, however, that WNHP uses a more inclusive definition of "invasive" than the narrowly defined list in the recovery plan

Table 27. Crosswalk from recovery plan prairie quality categories (native/nonnative cover) to EIA metrics, as well as EIA metric rating for sub-AAs at Lacamas Prairie NAP. Note that the recovery plan may use a narrower definition of invasive* (i.e. "nonnatives of particular concern") than WNHP.

Recovery Plan Prairie Quality Category	Recovery Plan Prairie Quality Criteria	Equivalent EIA Metric	Equivalent EIA Metric Rating Criteria	Lacamas EIA Metric Rating (2018)	Meets Recovery Plan Standard?
Cover of native vegetation	Relative native cover ≥ 50%	V1. Native Plant Species Cover	D (<60%)	Sub-AA 1 = D (39%) Sub-AA 2 = C (77%) Sub-AA 3 = D (77%)	Only sub-AA 2
Nonnative vegetation	Individual nonnative species ≤ 50% absolute cover. Total nonnatives of particular concern [i.e. invasives] ≤ 5%.	V2. Invasive Nonnative Plant Species Cover	B (1-4%; EIA combines covers of all invasives)	Sub-AA 1 = D (54% total invasives) Sub-AA 2 = C (15% total invasives) Sub-AA 3 = D (40% total invasives)	No (*Alopecurus pratensis* >5% in all sub-AAs). If *A. pratensis* is not considered invasive, then all sub-AAs meet standard

*"Nonnatives of particular concern" in recovery plan = *Arrhenatherum elatius, Brachypodium sylvaticum, Centaurea X pratensis, Cytisus scoparius, Phalaris arundinacea, Pyrus communis, Rubus armeniacus (=R. bifrons), Rubus vestitus,* "or other invasive species".

V3. Native Plant Species Composition

As a reminder, this metric assesses the overall species composition and diversity of the AA or sub-AA, including submetrics for native diagnostic species (V3a), native increasers (V3b), and native decreasers (V3c). Both sub-AAs where restoration work took place (1 and 3) improved from "D" to "C" ratings in the diagnostic species submetric, thanks primarily to increases in cover from *Deschampsia cespitosa* and *Carex unilateralis*. Tufted graminoids like those two species, along with *Carex densa, Carex pellita*, *Danthonia californica,* and others are the dominant ground cover in relatively intact wet prairie ecosystems. Characteristic species such as *Potentilla gracilis* and *Plagiobothrys figuratus* also improved by marginal amounts.

Native increasers are naturally common in wet prairies, but were present in only slightly elevated amounts in all three sub-AAs (all received "B" ratings in 2018). Brief, and unexplained, spikes were noted in both sub-AA 1 and 3 in 2017, primarily driven by a boom year for *Galium trifidum*. As noted above, no decreaser species were found in any sub-AA. These submetrics are difficult to assess repeatedly with different observers in an ecosystem that naturally has many increasers, but WNHP staff are currently working on ecosystems specific lists of increasers (as well as diagnostics, decreasers, and invasive species). These should be available soon.

Sub-AA 2 held steady in all three submetrics, receiving an overall native plant species composition rating of "B". This treatment unit is currently the reference standard management target for Natural Areas staff.

Improvements in this metric (and submetrics) coincide with one of the stated goals in the *Lomatium bradshawii* recovery plan: "These areas should be restored to functional prairie ecosystems with management that restores and maintains a diversity of native species typical of these prairie communities" (US Fish and Wildlife Service, 2010). The plan goes on to discuss the importance of flowering plant diversity for native pollinators. Among graminoids, *Deschampsia cespitosa* is a particularly important species. *Lomatium bradshawii* often occurs on or around senescent *Deschampsia* mounds (US Fish and Wildlife Service, 2010). Ongoing efforts to increase cover from cornerstone, diagnostic species like *Deschampsia cespitosa* along with establishment of diverse flowering forbs should continue to improve *Lomatium* habitat, as well as the integrity of the wet prairie as a whole.

Table 28 crosswalks the recovery plan's criteria for prairie diversity with the equivalent EIA metric and rating, along with the ratings assigned to each sub-AA at Lacamas Prairie. The plan sets a minimum target of 10 native prairie species per 25-m^2 plot, with prairie species to be defined by a "knowledgeable botanist or plant ecologist". In the EIA, diversity is evaluated within the diagnostic species submetric (V3a) of native plant species composition (V3). EIA does not use explicit numbers for species richness, as the method is applied in biodiverse to relatively species-poor ecosystems (though WNHP staff hope to produce guidelines for expected diversity/species richness in the future). We did not use 25 m^2 plots, so direct comparison is difficult, but the number of species with moderate-to-high prairie fidelity ranged from 23 (sub-AA 1) to 29 (sub-AA 2), with a mix of grasses, sedges, and forbs. Even if discounted slightly for the larger sample area, the sub-AAs at Lacamas are likely to have met the recovery plan criteria.

Table 28. Crosswalk from recovery plan prairie quality category (prairie diversity) to EIA metric, as well as EIA metric rating for sub-AAs at Lacamas Prairie NAP.

Recovery Plan Prairie Quality Category	Recovery Plan Prairie Quality Criteria	Equivalent EIA Metric	Equivalent EIA Metric Rating Criteria	Lacamas EIA Metric Rating (2018)	Meets Recovery Plan Standard?
Prairie diversity	Native prairie species richness > 10 species (measured in 25 m^2 plots), of which 7+ must be forbs and one must be a bunchgrass.	V3. Native Plant Species Composition	Considered as part of Diagnostic Species submetric (V3a) of Native Plant Species Composition (V3).	Sub-AA 1 = C (23 prairie species) Sub-AA 2 = A (29 prairie species) Sub-AA 3 = C (28 prairie species)	Different methodology, but likely.*

*Our protocols did not use 25 m^2 plots

V4. Vegetation Structure

Vegetation structure is perhaps easiest to visualize when dealing with forested ecosystems, but it is also an important characteristic of wet prairies. Dominant bunchgrasses and cespitose sedges form small pedestals in the prairie and increase habitat diversity. Hydrophytes can reside in the low spaces while species preferring drier conditions can join the graminoids on the pedestals.

Prairies continue to exist only where regular fire, flooding, or other disturbance inhibit succession to woody vegetation (Boyd, 1986; Franklin & Dyrness, 1988; Boag, 1992; US Fish and Wildlife Service, 2010). This succession to shrubland (either native shrubs, or invasive species such as *Rubus bifrons)* and eventually to forest is the primary threat to vegetation structure in these systems. However, native shrubs such as *Rosa nutkana* and *Crataegus douglasii* are also natural components of wet prairies, in small amounts.

Grassland structure can vary depending on the time since the last fire, with more bare ground naturally present soon after burns. Accounting for this natural progression, sub-AAs 1 and 3 declined from a "B" rating (Table 16) in the first year after the burn to a "C" rating in subsequent years. Rather than native bunchgrasses establishing in significant amounts, rhizomatous *Alopecurus pratensis* reinvaded. Rhizomatous grasses provide different structure (i.e. habitat) than the native bunchgrasses and cespitose sedges. Sub-AA 2, with its high cover of bunchgrasses and diverse array of interstitial forbs, exhibits structure that is near historical conditions (receiving an "A" rating).

Succession to woody vegetation is also one of the primary threats to *Lomatium bradshawii,* which thrives under frequent disturbance regimes (Habegger, 1998; Altman et al., 2001; US Fish and Wildlife Service, 2010). Other methods of truncating the successional trajectory include mowing and grazing, which may reduce small mammal herbivory of the *Lomatium* and its seeds, as well (Habegger, 1998). However, management for shrub encroachment may not always have positive impacts on the wet prairie plant associations. Annual mowing in the fall has been shown to increase the number of *Lomatium* individuals at some sites (US Fish and Wildlife Service, 2010), but invasive plants may also respond positively to mowing, either through introduction of fresh seed

from contaminated mowers, or through competition for sunlight. When considering mowing as an option to control native shrubs, one should first assess whether shrub patches are actually expanding in the prairie. This can be done with simple monitoring techniques. Also, note that closed canopy shrub patches that exhibit dense lichen growth on their outer edges are likely to be stable.

Grazing can be somewhat beneficial for *Lomatium bradshawii* (or at least not demonstrably negative) in some situations. For example, fall grazing has been shown to increase emergence of new *Lomatium* plants—although no changes in survival rates/population structure were observed (Drew, 2000). At other times of year, though, grazing may damage plants directly via biomass removal and trampling, or indirectly via soil disturbance (US Fish and Wildlife Service, 2010). This damage affects the wet prairie as a whole, carrying with it the additional risk of invasive species propagation. Thus, while grazing may be beneficial in reducing cover of woody species, the timing and application must be carefully managed and thus is not the preferred method for holding succession in check.

Table 29 crosswalks the recovery plan's criteria for woody vegetation with the equivalent EIA metric and rating, along with the ratings assigned to each sub-AA at Lacamas Prairie. The plan sets a goal of ≤ 15% absolute cover of woody vegetation and ≤ 5% cover of "species of management concern" (i.e. invasives). These standards would equate roughly to a "C" in the EIA's vegetation structure metric (V4; 10-25% shrub cover), but that metric also integrates other considerations, such as the distribution of shrubs (restricted to streambanks, in scattered small patches, etc.) and the structure of the grassland itself (bunchgrass v. rhizomatous perennials v. annual grasses, etc.). All of the sub-AAs at Lacamas met the recovery plan's criteria—the shrub species with the greatest cover at Lacamas (*Rosa nutkana*) topped out at 1-2%, and no unit exceeded 5% overall shrub cover.

Table 29. Crosswalk from recovery plan prairie quality category (cover of woody vegetation) to EIA metric, as well as EIA metric rating for sub-AAs at Lacamas Prairie NAP.

Recovery Plan Prairie Quality Category	Recovery Plan Prairie Quality Criteria	Equivalent EIA Metric	Equivalent EIA Metric Rating Criteria	Lacamas EIA Metric Rating (2018)	Meets Recovery Plan Standard?
Cover of woody vegetation	Woody vegetation ≤ 15% of absolute vegetative cover; species of management concern* [i.e. invasives] ≤ 5%	V4. Vegetation Structure	C (10-25%) (among other criteria)	Sub-AA 1 = C (marked down for conversion to rhizomatous grassland) Sub-AA 2 = A (29 prairie species) Sub-AA 3 = C (marked down for conversion to rhizomatous grassland)	Yes

*"Woody species of management concern" = *Crataegus monogyna, Crataegus suksdorfii, Cytisus spp., Pyrus communis, Rosa eglanteria, Rosa multiflora, Rubus armeniacus, Rubus laciniatus, Toxicodendron diversilobum*.

H1. Water Source
H2. Hydroperiod
H3. Hydrologic Connectivity
All three sub-AAs are hydrologically connected and received "C" ratings across the board for water source (H1), hydroperiod (H2) and hydrologic connectivity (H3) (as a reminder, hydrology metrics were scored based primarily on the presence of stressors, such as ditching, amount of nearby development that could increase stormwater runoff, etc.). There are significant stressors on site moving conditions beyond the natural range of variability, yet management appears to be coming close to replicating a natural regime. To confirm this, continued monitoring and research of the hydrology at Lacamas Prairie should be an ongoing priority. Indeed, the hydrology of Lacamas Prairie has been investigated on several occasions (Reynolds, 2004; D. Wilderman, unpublished data 2015, 2018). While detailed flow accumulation models have proven difficult to produce due to the cat's cradle of blocked, partially blocked, and free-flowing ditches, simple hydrologic wells can monitor hydroperiod and hydrologic connectivity (in relation to stream flows and precipitation events). It is particularly important to monitor the hydrology at Lacamas to ensure effective stormwater runoff mitigation from nearby developments. Monitoring can also help eliminate confounding variables when assessing changes in plant community composition following prescribed fire, seeding, mowing, herbicide application, etc. Hydrologic monitoring is currently in progress at Lacamas Prairie as part of a separate Section 6 grant (F16AF01135) to assess connectivity and natural area site design under climate change.

Lomatium bradshawii is a wet prairie-obligate species that relies on the seasonally saturated to flooded hydrology of these sites (Kagan, 1980; Finley, 1994; US Fish and Wildlife Service, 2010). While no *Lomatium* recovery actions related to hydrology have been recommended, hydrologic alteration is identified in the recovery plan as a threat to the species' habitat. Changes to the annual duration of soil saturation are particularly threatening, along with the corresponding impact on site species composition (US Fish and Wildlife Service, 2010). Wet prairie ecosystems are in part defined by their patterns of seasonal inundation, drawdown, saturation, and drying. Hydrologic manipulation to maintain and/or restore these patterns, aimed at the long-term survival of *Lomatium* populations, will also contribute to the integrity of the wet prairie plant associations in which they occur. The areas of Lacamas Prairie in the best condition (highest native cover, least invasive cover, most intact species composition) are those that remain saturated the longest.

S1. Soil Condition
Soil Condition (S1) is another metric assessed through proxy stressors, as a true assessment of soil condition is beyond the scope of short site visits. As outlined above, the entirety of Lacamas Prairie has been ditched. It was also grazed through the start of the new millennium, though past evaluators have argued that the site was "far enough from the barn" as to minimize grazing impacts (Reynolds, 2004). The "C" rating indicates that, while outside the natural range of variability, the cumulative impacts of these disturbances appear to be more moderate than on neighboring parcels.

Soil restoration work is not planned for Lacamas Prairie and none is recommended, aside from continued grazing exclusion. Filling in the shallow ditches on the prairie itself would be inadvisable, as these areas have the highest native plant cover, least invasive cover, and most intact native plant species composition. The berms between ditches may be dominated by invasive annual bromes and/or pasture grasses, but grading them to a lower elevation would have unpredictable impacts on the neighboring ditches and the overall hydrology of the site. Lowering berms would likely exclude annual bromes that are less tolerant of wet conditions, but it would also increase bare ground and opportunities for the spread of perennial invasives such as

Alopecurus pratensis and *Phalaris arundinacea*. As with hydrology, management of soil conditions to benefit *Lomatium bradshawii* is also likely to benefit wet prairie plant associations more broadly.

Size

Z1 Comparative Size

Size (Z1) can be an important metric for assessing the long-term viability of an ecosystem, particularly in a fragmented landscape. A large occurrence is buffered from landscape stressors to a greater degree than a smaller one within the same landscape. As noted above, wet prairies were historically small patch ecosystems of ~1 to upwards of 25 acres and the areas of intact wet prairie at Lacamas currently measure roughly 15 acres (a "B" rating). The entire approved Natural Area boundary measures 1820 acres, of which DNR Natural Areas currently owns and manages 201 acres. The acreage outside of the existing NAP includes riparian forest communities, agricultural land, structures, and small fragments of additional wet prairie (including one patch immediately abutting sub-AA 1). Partnership with neighboring landowners or acquisition of additional parcels within the approved boundary could effectively increase the size of the wet prairie plant association element occurrences at Lacamas. Along with work to restore current pasture/fallow land to wet prairie conditions, it is entirely possible for Lacamas Prairie to achieve an "A" rating in size.

While many recovery benchmarks for *Lomatium bradshawii* focus on improving the size and structure of the population, the size of the available wet prairie habitat is clearly an important element in recovery. Besides providing additional resilience to landscape level stressors, larger patches allow more flexibility in testing restoration techniques, as well as more opportunity for connectivity and gene flow with other patches. Property size is an explicit consideration for reintroduction areas (US Fish and Wildlife Service, 2010). Note however that large patches of *Lomatium bradshawii* do not perfectly correlate to large patches of wet prairie plant associations. Some remnant patches may still be too small for consideration as functional wet prairie ecosystems, though the *Lomatium* may be present.

Roll-Up

EIA is a multi-metric approach. Metrics are rolled up into Major Ecological Factors (MEF) for Landscape Context, Condition, and Size. Landscape Context and Condition are then integrated to produce an EIA Score that summarizes the ecological integrity of the AA. The Size MEF determines additional points that are either added or subtracted from the EIA Score to produce the Element Occurrence Rank (EO Rank). The EO Rank assesses the overall conservation value of the AA. Appendix B lays out the entire EIA scorecard for Lacamas Prairie and each sub-AA.

The EIA Score for Lacamas Prairie dropped from 2.12 (C+) in 2016 to 2.07 (still a C+) in 2018, due primarily to the rebound in *Alopecurus pratensis* in the years following the prescribed burn in sub-AA 1 (sub-AA 2 remained constant and sub-AA 3 improved its EIA Score). Factoring in Size, which is assessed over the entire AA, the EO Rank went from 2.37 (C+) to 2.32 (still a C+). These are insignificant changes when considering the margins of error in the underlying evaluations. For monitoring purposes—as opposed to conservation site prioritization, acquisition, etc.—it is typically more useful to focus on individual metric ratings, rather than rolled up EIA Scores or EO Ranks. Changes and trends in individual metrics may be smoothed over when combined into the higher-level scores. For example, while sub-AA 3 showed no change in EIA Score from 2016-2018, prescribed burning, post-fire herbicide, and planting of natives resulted in a net improvement in Native Plant Species Composition (V3) by 2018. By drilling down to individual metrics, we also see that the improvements in Vegetation Structure (V4) in 2017 were

short-lived, and that the reduction in Invasive Nonnative Plant Species Cover (V2) was not enough to produce anything better than a "D" in that metric.

Vegetation Data

This project used permanent vegetation modules to provide a finer resolution to vegetation assessment than a typical level 2 EIA. Some caveats should be made regarding the vegetation data, however. First, few trends were statistically significant after just two years (Appendices D and E), even with more intensive plots. They do, however, provide baseline data for follow-up surveys. Interpretation of these data should also factor in that burning occurred *before* the first sampling event in sub-AA 1 and between the surveys in 2016 and 2017 in sub-AA 3. Additionally, the sampling in 2017 was slightly later from a phenology perspective than 2016, despite efforts to match the timing. A record dry spring made 2018 later still.

As noted above, *Alopecurus pratensis* cover increased dramatically in the years following the burn in sub-AA 1, jumping by a remarkable 40 percentage points. *Poa pratensis* increased in frequency in that sub-AA by 75 percentage points, though its cover change was not statistically significant. In sub-AA 3, *A. pratensis* only had 13% cover in the year following a burn (increasing to 15% the subsequent year). Assuming that the initial cover was similar in these two units prior to the burns (it was 62% in sub-AA 3), this would indicate either that the fire in sub-AA 1 was less lethal to *A. pratensis*, or that the post-fire herbicide treatment was less effective. We could interpret these changes further if vegetation data existed for the season prior to the prescribed burn in sub-AA 1.

Galium trifidum had the greatest increase in cover for a native species between 2016 and 2018, jumping by 12 percentage points in sub-AA 2 and 9 percentage points over the entire AA. It is unclear what drove this increase, since it spread in every part of the AA, including sub-AA 2 (which received no restoration treatments). Cover across the AA fell back by 4 percentage points between 2017 and 2018. The spike between 2016 and 2017 may be related to the near-record wet winter and spring in that period. The National Weather Service measured 116 cm of rain at Portland International Airport from October 2016 through April 2017, making it the second wettest such period on record (Menne et al., 2012).

One notable vegetation improvement was in the number of species known to have moderate to high fidelity to prairies (Chappell et al., 2004; Alverson, 2009) (Figure 17). Along with improvements in diagnostic species (V3a) in sub-AAs 1 and 3, this seems to indicate that seeding and outplanting by Natural Areas staff is having success in initiating (at least) new populations of prairie species on the site. A number of prairie species also saw statistically significant increases in cover, including *Carex unilateralis* (moderate prairie fidelity), *Plagiobothrys figuratus* (high fidelity), and *Deschampsia cespitosa* (moderate fidelity). Future monitoring should focus on whether these gains can be maintained and improved upon. Note that Lacamas Creek jumped its banks and flooded all of sub-AA 1 in the winter of 2015-2016 (soon after the fall burn and seeding). Natural Area staff think some of the seed/plugs may have washed away during this event, which would explain the smaller increase in prairie obligates within that sub-AA.

Small increases in the cover of *Crataegus douglasii* (sub-AA 2) and *Rosa nutkana* shrubs (across the AA as a whole) were statistically significant, but neither gained more than 0.5 % cover over the project period. On the other hand, no vegetation modules ended up directly adjacent to neighboring woodlands/shrublands, where one might expect the most rapid encroachment.

Conclusion

The "Recovery Plan for the Prairie Species of Western Oregon and Southwestern Washington" (US Fish and Wildlife Service, 2010) identifies habitat destruction, isolation/fragmentation, invasive plant species, and succession as the primary threats to the long-term recovery of *Lomatium bradshawii* and other prairie species. This project demonstrated that EIA can be successfully deployed to assess the impacts of stressors on the condition of a wet prairie (or any ecosystem) and to monitor restoration and recovery effort. This is particularly true when combined with permanent vegetation plots that allow for greater statistical power with small sample sizes.

After updating plant association EO mapping, we used the multi-metric EIA approach to monitor the ecological integrity of Lacamas Prairie NAP via three sub-assessment areas—one each for three separate treatment units within the NAP. A few trends stood out. Development continued in the surrounding watershed, increasing impervious surface area and the potential for residential contaminants. This demonstrates the need for persistent hydrological monitoring of the site. The combination of prescribed fire and targeted herbicide produced short-term improvements in condition, particularly by reducing invasive cover and increasing relative native cover (including keystone, diagnostic species). However, these improvements may be short-lived. As time since the last fire increased, invasive cover rose dramatically and relative native cover dropped. Lastly, we found that recovery actions for *Lomatium bradshawii* are largely complementary to the condition of the wet prairie plant associations in which the species occurs. However, future restoration activities should carefully evaluate whether the removal of native shrubs from the prairie is necessary, as patches of *Rosa nutkana* and other species were a part of the historical natural variability of these systems.

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Appendix A - Recent Restoration Treatments at Lacamas Prairie NAP

*Only restoration projects within the assessment area are included here

Sub-AA 1 (3.9 acres, 5 vegetation modules)
• 2013 - Mowed woody plants (*Rosa* spp, *Spiraea douglasii*, *Crataegus* spp, *Fraxinus latifolia*, etc.)
• 2014 - Control of tree encroachment with ezject lance, foliar spray, and/or cut-stem methods
• 2014 - Control of nonnative forbs (*Leucanthemum vulgare*, *Dipsacus fullonum*, *Jacobaea vulgaris*, *Cirsium vulgare*, etc.) with herbicide spot-treatments
• 2014 - Spot treatments of isolated *Phalaris arundinacea* patches.
• Spring 2014 - Foliar treatment (with Garlon 3A) of woody plants mowed in 2013
• Fall 2014 - Mowed woody plants (*Rosa* spp, *Spiraea douglasii*, *Crataegus* spp, *Fraxinus latifolia*, etc.)
• 2015 - Continued treatment of woody plants
• 2015 - Continued control of nonnative forbs (*Leucanthemum vulgare*, *Dipsacus fullonum*, *Jacobaea vulgaris*, *Cirsium vulgare*, etc.) with herbicide spot-treatments
• 2015 - Continued spot treatments of isolated *Phalaris arundinacea* patches.
• Fall 2015 - Prescribed burn
• Fall 2015 - Sprayed resprouting *Alopecurus pratensis* with Aquamaster (aquatic glyphosate) using boom sprayer before most native species were resprouting
• Fall 2015 - Seeded burn unit with *Achillea millefolium*, *Carex pachystachya*, *Carex unilateralis*, *Dichelostemma congestum*, *Eriophyllum lanatum*, *Juncus ensifolius*, *Juncus tenuis*, *Lotus pinnatus*, *Potentilla gracilis*, *Ranunculus occidentalis*, *Ranunculus orthorhynchus*, *Saxifraga oregana*, *Sisyrinchium idahoense*.
• Fall 2015 - Planted plugs of *Achillea millefolium*, *Symphyotrichum subspicatum*, *Camassia quamash*, *Deschampsia cespitosa*, *Eriophyllum lanatum*, *Lomatium bradshawii*, *Lupinus polyphyllus*, *Plagiobothrys figuratus*, *Potentilla gracilis*, *Ranunculus alismifolius*, *Ranunculus occidentalis*, *Ranunculus orthorhynchus*, *Ranunculus sceleratus*, and *Sisyrinchium idahoense*.*
• 2016 - Continued control of nonnative forbs (*Leucanthemum vulgare*, *Dipsacus fullonum*, *Jacobaea vulgaris*, *Cirsium vulgare*, etc.) with herbicide spot-treatments
• 2016 - Continued spot treatments of isolated *Phalaris arundinacea* patches.
• Seeded and plugged with native forbs and sedges (11/2015, supplemented 3/2016)
• Treated with grass-specific herbicide 4/2016 (before flowering)
Sub-AA 2 (8.9 acres, 10 vegetation modules)
• 2013 - Mowed woody plants (Rosa spp, Spiraea douglasii, Crataegus spp, Fraxinus latifolia, etc.)
• 2014 - Control of tree encroachment with ezject lance, foliar spray, and/or cut-stem methods
• 2014 - Control of nonnative forbs (*Leucanthemum vulgare*, *Dipsacus fullonum*, *Jacobaea vulgaris*, *Cirsium vulgare*, etc.) with herbicide spot-treatments
• Spring 2014 - Foliar treatment (with Garlon 3A) of woody plants mowed in 2013
• Fall 2014 - Mowed woody plants (*Rosa* spp, *Spiraea douglasii*, *Crataegus* spp, *Fraxinus latifolia*, etc.)

- 2015 - Continued treatment of woody plants
- 2015 - Continued control of nonnative forbs (*Leucanthemum vulgare*, *Dipsacus fullonum*, *Jacobaea vulgaris*, *Cirsium vulgare*, etc.) with herbicide spot-treatments
- 2015 - Continued spot treatments of isolated *Phalaris arundinacea* patches.

Sub-AA 3 (1.8 acres, 5 vegetation modules)

- 2013 - Mowed woody plants (Rosa spp, Spiraea douglasii, Crataegus spp, Fraxinus latifolia, etc.)
- 2014 - Control of tree encroachment with ezject lance, foliar spray, and/or cut-stem methods
- 2014 - Control of nonnative forbs (*Leucanthemum vulgare*, *Dipsacus fullonum*, *Jacobaea vulgaris*, *Cirsium vulgare*, etc.) with herbicide spot-treatments
- Spring 2014 - Foliar treatment (with Garlon 3A) of woody plants mowed in 2013
- Fall 2014 - Mowed woody plants (*Rosa* spp, *Spiraea douglasii*, *Crataegus* spp, *Fraxinus latifolia*, etc.)
- 2015 - Continued treatment of woody plants
- 2015 - Continued control of nonnative forbs (*Leucanthemum vulgare*, *Dipsacus fullonum*, *Jacobaea vulgaris*, *Cirsium vulgare*, etc.) with herbicide spot-treatments
- 2015 - Continued spot treatments of isolated *Phalaris arundinacea* patches.
- Fall 2016 - Prescribed burn
- Fall 2016 - Sprayed resprouting *Alopecurus pratensis* with Aquamaster (aquatic glyphosate) using backpack sprayer before most native species were resprouting.
- Fall 2016 - Seeded burn unit with *Achillea millefolium*, *Barbarea orthoceras*, *Carex pachystachya*, *Carex stipata*, *Danthonia californica*, *Deschampsia cespitosa*, *Carex unilateralis*, *Juncus ensifolius*, *Juncus tenuis*, *Potentilla gracilis*, *Ranunculus occidentalis*, *Ranunculus sceleratus*, *Lupinus polyphyllus* and *Plagiobothrys figuratus*
- Fall 2016 - Planted plugs of *Achillea millefolium*, *Symphyotrichum subspicatum*, *Camassia quamash*, *Deschampsia cespitosa*, *Eriophyllum lanatum*, *Lomatium bradshawii*, *Lupinus polyphyllus*, *Potentilla gracilis*, *Ranunculus occidentalis*, *Ranunculus orthorhynchus*, *Ranunculus sceleratus*, *Wyethia angustifolia*, *Downingia elegans*, and *Sisyrinchium idahoense*.*
- 2016 - Continued control of nonnative forbs (*Leucanthemum vulgare*, *Dipsacus fullonum*, *Jacobaea vulgaris*, *Cirsium vulgare*, etc.) with herbicide spot-treatments
- 2016 - Continued spot treatments of isolated *Phalaris arundinacea* patches.
- Spring 2017 - Southern 1/3 of this unit did not respond to glyphosate treatment (from Fall 2016)—retreated with fusillade (grass-specific herbicide) and aquamaster
- Spring 2017 - Seeded *Deschampsia cespitosa*
- Spring 2017 - Planted plugs of *Deschampsia cespitosa*, *Downingia elegans*, *Ranunculus sceleratus*, and *Ranunculus sceleratus*

*Note: Record rains in the winter of 2015-2016 flooded Lacamas Creek and the entire sub-AA was under 15-20 cm of water for much of the winter. Some of the seed/plugs may have washed away.

Appendix B - EIA Metric Ratings and Final Roll-Up

Table B-1. EIA roll-up calculations.

Roll-up Calculations
L1. Contiguous Natural Land Cover
L2. Land Use Index
L MEF Score = (L1+L2)/2
B1. Perimeter with Natural Buffer
B2. Width of Natural Buffer
B3. Condition of Natural Buffer
B MEF Score = $(((B1*B2)^{1/2})*B3)^{1/2}$ [Note: ½ exponent = square root]
LANDSCAPE CONTEXT FACTOR SCORE = (B Score*0.67)+(L Score*0.33)
V1. Native Plant Species Cover
V2. Invasive Nonnative Plant Species Cover
V3. Native Plant Species Composition
V4. Vegetation Structure
V5. Woody Regeneration
V6. Coarse Woody Debris
V (non-forested) MEF Score = (V1+V2+V3+V4)/4
V (forested) MEF Score = (V1+V2+V3+V4+V5+V6)/6
H1. Water Source
H2. Hydroperiod
H3. Hydrological Connectivity
H MEF Score = (H1+H2+H3)/3
S1. Soil Condition
S MEF Score = S1
CONDITION FACTOR SCORE = (V Score*0.55)+(H Score*0.35)+(S Score*0.1)
EIA SCORE = (Condition Factor Score*0.7)+(Landscape Context Factor Score*0.3)
Z1. Comparative Size
Z2. Change in Size (optional)
Z MEF Score = Z1 OR (Z1+Z2)/2
SIZE Points
ELEMENT OCCURRENCE RANK (EORANK) = EIA Score + SIZE Points

Table 1. Metric Rank / Score Conversions

Rank	A	A-	B	C	C-	D
Score	4	3.5	3	2	1.5	1

Table 2. Score / Rank Conversions for MEF, EIA and EORANK calculations

Rank	A+	A-	B+	B-	C+	C-	D
Score	3.8 - 4.00	3.5 - 3.79	3.0 - 3.49	2.5 - 2.99	2.0 - 2.49	1.5 - 1.99	1 - 1.49

Table 3. Point Contribution of Size Primary Factor Score

Size Primary Factor Rating	**Very Small/Small Patch**	**Large Patch**	**Matrix**
A = Size meets A ranked rating	+ 0.75	+ 1.0	+1.5
B = Size meets B ranked rating	+ 0.25	+ 0.33	+0.5
C = Size meets C ranked rating	- 0.25	- 0.33	-0.5
D = Size meets D ranked rating	- 0.75	-1.0	-1.5

EORANK	**Global Rank** / **State Rank**	G1S1, G2S1, GNRS1, GUS1	G2S2, GNRS2, G3S1, G3S2, GUS2	GUS3, GNRS3, G3S3, G4S1, G4S2, G5S1, G5S2, any SNR	G4S3, G4S4, G5S3, G5S4, G5S5, GNRS4, GNRS5, GUS4, GUS5
A+ (3.8 to 4.0)		EO	EO	EO	EO
A- (3.5 to 3.79)		EO	EO	EO	EO
B+ (3.0 to 3.49)		EO	EO	EO	Not an Element Occurrence
B- (2.5 to 2.99)		EO	EO	EO	
C+ (2.0 to 2.49)		EO	EO	Not an Element Occurrence	
C- (1.5 to 1.99)		EO	Not an Element Occurrence		
D (1.0 to 1.49)		EO			

Table B-2. EIA metric ratings at Lacamas Prairie NAP for each sub-AA and year at Lacamas Prairie NAP.

	Factor	Landscape Context					Condition													Size	
	Major Ecological Factor (MEF)	Landscape		Buffer			Vegetation									Hydrology			Soil	Size	
Sub-AA	Year	L1	L2	B1	B2	B3	V1	V2	V3	V3a	V3b	V3c	V4	V5	V6	H1	H2	H3	S1	Z1	Z2
1	2016	C	C	C	C	C	C	C-	C	D	B	C	B	--	--	C	C	C	C	B	--
1	2017	C	C	C	C	C	D	D	C	D	C	C	C	--	--	C	C	C	C	B	--
1	2018	C	C	C	C	C	D	D	C	C	B	C	C	--	--	C	C	C	C	B	--
2	2016	C	C	C	C	C	C	C-	B	A	B	C	A	--	--	C	C	C	C	B	--
2	2017	C	C	C	C	C	C	C-	B	A	B	C	A	--	--	C	C	C	C	B	--
2	2018	C	C	C	C	C	C	C-	B	A	B	C	A	--	--	C	C	C	C	B	--
3	2016	C	C	C	C	C	D	D	D	D	B	C	C	--	--	C	C	C	C	B	--
3	2017	C	C	C	C	C	D	D	D	D	C	C	B	--	--	C	C	C	C	B	--
3	2018	C	C	C	C	C	D	D	C	C	B	C	C	--	--	C	C	C	C	B	--

Table B-3. Roll-up of Major Ecological Factors (MEF) and EIA Ranks for each sub-AA and year at Lacamas Prairie NAP. EIA Score / Rank weights Condition 70% and Landscape Context 30%. EORANK integrates size, but is not appropriate for use with individual sub-AAs.

Sub-AA	Year	Landscape MEF	Buffer MEF	Vegetation MEF	Hydrology MEF	Soil/ Substrate MEF	Landscape Context Score	Condition Score	Landscape Context Rank	Condition Rank	EIA Score	EIA Rank
1	2016	2.00	2.00	2.13	2.00	2.00	2.00	2.07	C	C	2.05	C+
1	2017	2.00	2.00	1.50	2.00	2.00	2.00	1.73	C	C	1.81	C-
1	2018	2.00	2.00	1.50	2.00	2.00	2.00	1.73	C	C	1.81	C-
2	2016	2.00	2.00	2.63	2.00	2.00	2.00	2.34	C	C	2.24	C+

2	2017	2.00	2.00	2.63	2.00	2.00	2.00	2.34	C	C	2.24	C+
2	2018	2.00	2.00	2.63	2.00	2.00	2.00	2.34	C	C	2.24	C+
3	2016	2.00	2.00	1.25	2.00	2.00	2.00	1.59	C	C	1.71	C-
3	2017	2.00	2.00	1.50	2.00	2.00	2.00	1.73	C	C	1.81	C-
3	2018	2.00	2.00	1.50	2.00	2.00	2.00	1.73	C	C	1.81	C-

Table B-4. Overall EIA Rank and EORANK for each year over the full AA at Lacamas Prairie NAP. Sub-AAs were weighted by percentage of total area.

Year	Landscape Context Score	Condition Score	Landscape Context Rank	Condition Rank	EIA Score	EIA Rank	Size Score	Size "Points"	EORANK Score	EORANK
2016	2.00	2.18	C	C	2.12	C+	3.00	0.25	2.37	C+
2017	2.00	2.10	C	C	2.07	C+	3.00	0.25	2.32	C+
2018	2.00	2.10	C	C	2.07	C+	3.00	0.25	2.32	C+

Appendix C - Species List

Table C-1. All taxon documented in vegetation modules at Lacamas Prairie NAP from 2016-2018. All taxa were identified to the species level (or finer) when possible. A "best guess" was made for seedlings, etc. without distinguishing features (e.g. "cf…" or "unknown forb"). Nomenclature from Washington Flora Checklist (University of Washington Herbarium, 2018).

Taxon	C-Value	Nativity
Achillea millefolium	2	Native
Agrostis exarata	3	Native
Alopecurus pratensis	0	Exotic
Amelanchier alnifolia	4	Native
Anthoxanthum odoratum	0	Exotic
Barbarea orthoceras	3	Native
Bromus commutatus	0	Exotic
Camassia quamash	3	Native
Cardamine cf. oligosperma	--	Native
Carex densa	4	Native
Carex leporina	Not Scored	Native
Carex obnupta	2	Native
Carex pachystachya	2	Native
Carex pellita	4	Native
Carex sp.	--	Native
Carex tumulicola	4	Native
Carex unilateralis	6	Native
Centaurium erythraea	0	Exotic
Cerastium fontanum ssp. vulgare	0	Exotic
Cirsium arvense	0	Exotic
Cirsium sp. (presumably C. arvense or C. vulgare cotyledons/rosette)	0	Exotic
Cirsium vulgare	0	Exotic
Convolvulus arvensis	0	Exotic
Crataegus douglasii	3	Native
Crataegus monogyna var. monogyna	0	Exotic
Cynosurus cristatus	0	Exotic
Danthonia californica	4	Native
Daucus carota	0	Exotic
Deschampsia cespitosa	5	Native
Dianthus armeria	0	Exotic
Dipsacus fullonum	0	Exotic
Dodecatheon sp.	6	Native
Eleocharis acicularis	4	Native
Eleocharis palustris	4	Native
Epilobium brachycarpum	3	Native
Epilobium ciliatum	2	Native
Epilobium densiflorum	4	Native

Taxon	C-Value	Nativity
Epilobium sp.	2	Native
Equisetum arvense	1	Native
Eriophyllum lanatum	4	Native
Eryngium petiolatum	5	Native
Fraxinus latifolia	2	Native
Galium aparine	1	Native
Galium trifidum	3	Native
Geranium dissectum	0	Exotic
Geranium molle	0	Exotic
Geum macrophyllum	2	Native
Gnaphalium palustre	4	Native
Gratiola ebracteata	4	Native
Holcus lanatus	0	Exotic
Hordeum brachyantherum	3	Native
Hypericum perforatum	0	Exotic
Hypochaeris radicata	0	Exotic
Juncus balticus ssp. ater	4	Native
Juncus bufonius	2	Native
Juncus effusus ssp. pacificus	2	Native
Juncus saximontanus	Not Scored	Native
Juncus sp.	--	Native?
Juncus tenuis	3	Native
Lactuca serriola	0	Exotic
Lamiaceae sp.	--	Unknown
Leucanthemum vulgare	0	Exotic
Lolium persicum	0	Exotic
Lomatium bradshawii	5	Native
Lomatium sp.	4	Native
Lotus corniculatus	0	Exotic
Lotus sp.	0	Exotic
Lupinus polyphyllus	3	Native
Luzula multiflora	5	Native
Lythrum portula	0	Exotic
Madia elegans	2	Native
Madia sativa	3	Native
cf. Madia sp.	--	Unknown
Micranthes oregana	4	Native
Montia linearis	4	Native
Myosotis discolor	0	Exotic
Myosotis laxa	3	Native
Navarretia intertexta	2	Native
Bellardia viscosa	0	Exotic

Taxon	C-Value	Nativity
Perideridia montana	6	Native
Persicaria hydropiperoides	4	Native
Persicaria sp.	--	Unknown
Phalaris arundinacea	0	Exotic
Plagiobothrys figuratus	3	Native
Plantago lanceolata	0	Exotic
Poa compressa	0	Exotic
Poa pratensis	0	Exotic
Poaceae sp.	--	Unknown
Potentilla gracilis	5	Native
Prunella vulgaris var. lanceolata	3	Native
Quercus garryana	4	Native
Ranunculus occidentalis var. occidentalis	4	Native
Ranunculus orthorhynchus	4	Native
Ranunculus sceleratus	4	Native
Ranunculus uncinatus	4	Native
Rorippa curvisiliqua	2	Native
Rorippa palustris	2	Native
Rosa nutkana ssp. nutkana	4	Native
Rosa pisocarpa	4	Native
Rosa sp.	--	Native?
Rubus bifrons	0	Exotic
Rumex acetosella	0	Exotic
Rumex crispus	0	Exotic
Rumex sp.	--	Unknown
Sanicula crassicaulis	3	Native
Schedonorus arundinaceus	0	Exotic
Jacobaea vulgaris	0	Exotic
Sisyrinchium idahoense	6	Native
Solanum dulcamara	0	Exotic
Sonchus asper	0	Exotic
Spiraea douglasii	3	Native
Symphoricarpos albus	3	Native
Symphyotrichum sp.	4	Native
Taraxacum officinale	0	Exotic
Trifolium dubium	0	Exotic
Trifolium repens	0	Exotic
Trifolium sp.	0	Exotic
Trifolium subterraneum	0	Exotic
Triteleia hyacinthina	5	Native
Unknown Aquatic Forb 1	--	Unknown
Unknown Aquatic Forb 2	--	Unknown

Taxon	C-Value	Nativity
Unknown Forb 1	--	Unknown
Unknown Forb 2	--	Unknown
Verbascum blattaria	0	Exotic
Veronica arvensis	0	Exotic
Veronica peregrina var. xalapensis	3	Native
Veronica scutellata	4	Native
Veronica serpyllifolia var. serpyllifolia	0	Exotic
Veronica sp.	--	Unknown
Vicia hirsuta	0	Exotic
Vicia sativa	0	Exotic
Vicia tetrasperma	0	Exotic
Vulpia bromoides	0	Exotic

Table C-1. Additional taxa observed incidentally on Lacamas Prairie from 2016-2018, but not present in vegetation modules (forested/shrubland areas excluded).

Taxon	C-Value	Nativity
Bromus cf. ciliatus	Not Scored	Native?
Bromus hordeaceus ssp. hordeaceus	0	Exotic
Carex feta	4	Native
Carex vulpinoidea	4	Native
Eryngium petiolatum	5	Native
Fontinalis sp.	--	Native
Penstemon hesperius	Not Scored	Native
Rosa pisocarpa	4	Native

Appendix D - Trends in Species Cover and Frequency at Lacamas Prairie NAP

Table D-1. Mean cover (%) for each sub-AA and year at Lacamas Prairie NAP from 2016-2018. Only species used in FQA analysis are presented here.

Mean Cover (%)	Sub-AA 1 (Burned Fall 2015)			Sub-AA 2 (High Quality)			Sub-AA 3 (Burned Fall 2016)			Full AA		
Species	2016	2017	2018	2016	2017	2018	2016	2017	2018	2016	2017	2018
Achillea millefolium	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.5	0.5	0.0	0.2	0.1
Agrostis exarata	0.0	0.0	0.0	0.1	0.1	0.2	0.0	0.0	0.0	0.0	0.1	0.1
Alopecurus pratensis	7.5	40.0	47.5	7.0	8.8	6.5	61.7	13.3	15.3	21.5	16.5	17.4
Amelanchier alnifolia	0.0	0.0	0.0	0.0	0.1	0.2	0.0	0.0	0.0	0.0	0.1	0.1
Anthoxanthum odoratum	0.1	0.4	1.3	2.9	3.7	3.5	7.9	0.1	1.7	3.6	2.0	2.6
Barbarea orthoceras	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.5	0.0	0.1	0.1
Bromus commutatus	0.0	0.1	0.5	3.9	2.8	4.5	12.7	0.1	0.6	5.4	1.5	2.6
Camassia quamash	0.4	0.4	0.1	3.8	0.0	0.1	0.1	0.3	0.1	2.1	0.2	0.1
Cardamine cf. oligosperma	0.5	0.0	0.0	0.2	0.2	0.1	0.1	0.0	0.0	0.2	0.1	0.1
Carex densa	0.9	1.4	3.3	17.4	17.2	17.2	1.6	1.2	1.4	9.8	9.7	10.1
Carex obnupta	0.0	0.0	0.0	0.1	0.2	0.2	0.0	0.0	0.0	0.1	0.1	0.1
Carex pachystachya	0.0	0.1	0.3	0.0	0.0	0.1	0.2	0.4	0.4	0.1	0.1	0.2
Carex pellita	0.0	0.0	0.0	4.4	4.4	4.6	0.0	0.0	0.0	2.3	2.3	2.4
Carex tumulicola	0.1	0.3	0.0	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.2	0.1
Carex unilateralis	1.5	3.3	5.5	6.3	6.5	6.6	3.2	2.5	4.0	4.4	4.8	5.7
Centaurium erythraea	0.5	0.3	0.1	0.2	0.2	0.1	0.0	0.0	0.1	0.2	0.2	0.1
Cerastium fontanum ssp. vulgare	0.0	0.3	0.5	0.1	0.2	0.1	0.1	0.2	0.6	0.1	0.2	0.3
Cirsium arvense	0.5	0.1	0.1	0.0	0.0	0.0	0.2	0.3	0.4	0.2	0.1	0.1
Cirsium sp.	0.1	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0
Cirsium vulgare	0.3	0.0	0.1	0.1	0.1	0.1	0.0	0.1	0.3	0.1	0.1	0.2
Convolvulus arvensis	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.4	0.0	0.0	0.1
Crataegus douglasii	0.0	0.0	0.1	0.1	0.3	0.3	0.2	0.1	0.2	0.1	0.2	0.2
Crataegus monogyna var. monogyna	0.0	0.0	0.0	0.2	0.2	0.3	0.0	0.0	0.1	0.1	0.1	0.2
Cynosurus cristatus	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1

Mean Cover (%)	Sub-AA 1 (Burned Fall 2015)			Sub-AA 2 (High Quality)			Sub-AA 3 (Burned Fall 2016)			Full AA		
Species	2016	2017	2018	2016	2017	2018	2016	2017	2018	2016	2017	2018
Danthonia californica	0.1	0.1	0.0	1.1	0.6	0.6	0.0	0.0	0.0	0.6	0.3	0.3
Daucus carota	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.1	0.2	0.0	0.1	0.1
Deschampsia cespitosa	0.1	0.5	1.4	16.1	23.3	25.3	0.5	1.4	4.8	8.6	12.7	14.9
Dianthus armeria	0.0	0.1	0.3	0.2	0.1	0.1	0.0	0.0	0.1	0.1	0.1	0.1
Dipsacus fullonum	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.2	0.0	0.0	0.1
Dodecatheon sp.	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Eleocharis acicularis	0.0	0.0	1.3	1.4	1.0	1.0	0.0	0.0	0.1	0.7	0.5	0.8
Eleocharis palustris	0.1	0.0	0.1	0.2	0.2	0.2	0.0	0.0	0.0	0.1	0.1	0.1
Epilobium brachycarpum	0.0	0.1	0.1	0.0	0.2	0.4	0.0	0.2	0.3	0.0	0.2	0.3
Epilobium ciliatum	5.0	0.4	0.4	0.9	0.5	0.6	0.3	0.9	0.4	1.6	0.6	0.5
Epilobium densiflorum	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.0
Epilobium sp.	0.1	0.1	0.0	0.1	0.1	0.0	0.1	0.0	0.1	0.1	0.1	0.0
Equisetum arvense	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Eriophyllum lanatum	0.5	0.5	0.5	0.0	0.0	0.0	0.0	0.3	0.5	0.1	0.2	0.2
Eryngium petiolatum	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fraxinus latifolia	0.0	0.5	0.4	0.2	0.4	0.4	4.0	3.9	0.5	1.2	1.3	0.4
Galium aparine	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.4	0.1	0.1	0.1	0.0
Galium trifidum	4.0	22.5	9.0	6.1	22.4	18.4	0.7	1.1	4.7	4.2	16.8	12.8
Geranium dissectum	0.0	0.1	1.0	0.1	0.1	0.1	5.1	0.3	9.3	1.4	0.1	2.7
Geranium molle	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.0	0.1	0.0
Geum macrophyllum	0.0	0.1	0.0	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.2	0.1
Gnaphalium palustre	0.5	0.3	0.3	0.1	0.0	0.0	0.0	0.4	0.4	0.2	0.2	0.2
Gratiola ebracteata	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.2	0.3	0.0	0.1	0.1
Holcus lanatus	0.3	1.0	3.3	4.5	3.0	2.6	2.4	0.4	2.3	3.0	1.9	2.7
Hordeum brachyantherum	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hypericum perforatum	0.1	0.3	0.0	0.0	0.0	0.0	0.2	0.3	0.0	0.1	0.1	0.0
Hypochaeris radicata	0.5	0.5	0.5	0.4	0.3	0.7	0.1	0.0	0.3	0.3	0.3	0.5
Juncus balticus ssp. ater	3.1	1.4	1.4	0.0	0.0	0.0	1.2	1.2	0.4	1.0	0.6	0.4
Juncus bufonius	0.4	0.6	0.1	0.1	0.2	0.1	0.1	1.3	0.4	0.1	0.6	0.2

Mean Cover (%)	Sub-AA 1 (Burned Fall 2015)			Sub-AA 2 (High Quality)			Sub-AA 3 (Burned Fall 2016)			Full AA		
Species	2016	2017	2018	2016	2017	2018	2016	2017	2018	2016	2017	2018
Juncus effusus ssp. pacificus	0.0	0.0	0.0	0.0	0.1	0.0	0.2	0.1	0.1	0.1	0.1	0.0
Juncus tenuis	0.8	0.6	0.8	2.1	1.9	1.5	0.4	0.6	0.6	1.3	1.3	1.1
Lactuca serriola	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.1	0.4	0.0	0.0	0.1
Leucanthemum vulgare	0.1	0.3	0.1	0.7	0.5	0.4	0.8	13.7	17.4	0.6	3.9	4.8
Lolium persicum	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0
Lomatium bradshawii	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.1	0.1	0.0	0.1	0.1
Lomatium sp.	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lotus corniculatus	0.0	0.0	0.0	1.9	2.2	2.2	0.0	0.1	0.0	1.0	1.2	1.1
Lotus sp.	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
Lupinus polyphyllus	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.4	0.1	0.0	0.2	0.1
Luzula multiflora	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1
Lythrum portula	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
Madia elegans	0.0	0.4	0.0	0.0	0.0	0.1	0.0	0.2	0.4	0.0	0.1	0.2
Madia sativa	0.0	0.0	0.6	0.1	0.0	0.3	0.0	0.0	0.3	0.1	0.0	0.3
Micranthes oregana	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0
Montia linearis	0.3	0.3	0.5	0.1	0.2	0.2	0.0	0.1	0.7	0.1	0.2	0.4
Myosotis discolor	0.4	0.4	0.5	0.4	0.4	0.5	0.2	1.8	0.4	0.3	0.8	0.4
Myosotis laxa	2.0	3.3	1.0	3.9	2.8	2.5	0.6	0.6	1.2	2.6	2.3	1.8
Navarretia intertexta	0.4	0.5	0.1	0.1	0.1	0.1	0.0	0.1	0.3	0.1	0.2	0.1
Bellardia viscosa	0.1	0.4	0.4	0.1	0.4	0.3	0.0	0.5	0.4	0.1	0.4	0.3
Perideridia montana	2.6	0.5	0.4	0.0	0.2	0.2	1.6	17.8	0.9	1.0	4.9	0.4
Persicaria hydropiperoides	0.1	0.1	0.1	0.3	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0
Phalaris arundinacea	0.0	0.4	0.1	0.0	0.2	0.1	0.0	0.0	0.0	0.0	0.2	0.1
Plagiobothrys figuratus	2.1	3.0	5.5	0.6	0.3	0.7	0.2	0.9	4.4	0.8	1.0	2.7
Plantago lanceolata	0.0	0.0	0.0	0.3	0.2	0.2	0.1	0.0	0.2	0.2	0.1	0.1
Poa compressa	0.4	0.5	0.5	0.1	0.1	0.1	0.0	0.1	0.1	0.1	0.2	0.2
Poa pratensis	0.4	5.3	5.3	1.0	1.3	1.3	2.1	0.4	1.2	1.1	1.9	2.1
Potentilla gracilis	0.5	0.4	0.4	0.2	0.3	0.2	0.0	0.3	0.6	0.2	0.3	0.3
Prunella vulgaris var. lanceolata	0.4	2.5	2.8	0.5	1.0	0.8	0.2	0.2	2.1	0.4	1.1	1.5

Mean Cover (%)	Sub-AA 1 (Burned Fall 2015)			Sub-AA 2 (High Quality)			Sub-AA 3 (Burned Fall 2016)			Full AA		
Species	2016	2017	2018	2016	2017	2018	2016	2017	2018	2016	2017	2018
Quercus garryana	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
Ranunculus occidentalis var. occidentalis	0.1	0.1	0.3	1.1	1.0	1.0	0.1	0.4	0.4	0.6	0.6	0.7
Ranunculus orthorhynchus	0.4	0.5	0.3	0.0	0.1	0.1	0.1	0.5	0.6	0.1	0.3	0.2
Ranunculus sceleratus	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.5	0.2	0.0	0.2	0.1
Ranunculus uncinatus	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0
Rorippa curvisiliqua	0.3	0.5	0.8	0.3	0.1	0.2	0.5	0.4	1.4	0.3	0.2	0.6
Rorippa palustris	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rosa nutkana ssp. nutkana	1.3	0.8	1.8	0.7	0.8	1.1	1.0	0.6	2.1	0.9	0.7	1.5
Rosa pisocarpa	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0
Rubus bifrons	0.0	0.0	0.4	0.1	0.0	0.0	0.0	0.1	0.2	0.0	0.0	0.1
Rumex acetosella	0.0	0.1	0.0	0.1	0.0	0.0	0.3	0.3	0.1	0.1	0.1	0.0
Rumex crispus	0.0	0.3	0.3	0.2	0.2	0.1	0.4	0.2	0.4	0.2	0.2	0.2
Sanicula crassicaulis	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0
Schedonorus arundinaceus	0.0	0.0	0.0	2.0	1.6	1.5	0.2	0.1	0.0	1.1	0.8	0.8
Jacobaea vulgaris	0.3	0.0	0.0	0.4	0.3	0.2	0.2	0.0	0.1	0.3	0.1	0.1
Sisyrinchium idahoense	0.0	0.4	0.3	0.3	0.2	0.0	0.0	0.3	0.3	0.1	0.2	0.1
Solanum dulcamara	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sonchus asper	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.2	0.4	0.0	0.1	0.1
Spiraea douglasii	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0
Symphoricarpos albus	0.0	0.0	0.0	0.1	0.1	0.1	0.7	0.3	0.7	0.2	0.1	0.2
Symphyotrichum sp.	0.0	0.3	0.5	0.9	0.5	0.5	0.1	0.2	0.6	0.5	0.4	0.5
Taraxacum officinale	0.0	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.3	0.1	0.1	0.2
Trifolium dubium	0.0	0.4	0.4	0.0	0.1	0.0	0.0	0.2	0.9	0.0	0.2	0.3
Trifolium repens	0.0	0.1	0.1	0.0	0.0	0.0	0.1	0.1	0.2	0.0	0.1	0.1
Trifolium sp.	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
Trifolium subterraneum	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	3.2	0.0	0.0	0.9
Triteleia hyacinthina	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Verbascum blattaria	0.1	0.1	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1

Mean Cover (%)	Sub-AA 1 (Burned Fall 2015)			Sub-AA 2 (High Quality)			Sub-AA 3 (Burned Fall 2016)			Full AA		
Species	2016	2017	2018	2016	2017	2018	2016	2017	2018	2016	2017	2018
Veronica arvensis	0.1	0.1	0.3	0.3	0.3	0.2	0.2	0.3	0.3	0.2	0.2	0.2
Veronica peregrina var. xalapensis	0.5	0.4	0.3	0.0	0.0	0.1	0.0	0.6	0.5	0.1	0.2	0.2
Veronica scutellata	0.0	0.5	0.5	0.5	0.8	0.8	0.0	0.0	0.0	0.3	0.5	0.5
Veronica serpyllifolia var. serpyllifolia	0.0	0.1	0.3	0.0	0.1	0.3	0.0	0.2	0.1	0.0	0.1	0.2
Vicia hirsuta	0.0	0.0	0.0	0.2	0.3	0.3	0.5	0.3	2.3	0.2	0.2	0.7
Vicia sativa	0.0	0.0	0.0	0.1	0.0	0.1	0.2	0.0	0.4	0.1	0.0	0.1
Vicia tetrasperma	0.1	0.3	0.5	0.3	0.3	0.4	0.5	0.5	1.5	0.3	0.3	0.7
Vulpia bromoides	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table D-2. Change in mean cover (percentage points), *t*-statistic, and *p*-values for each species in sub-AA 1 at Lacamas Prairie NAP from 2016-2018. Only species used in FQA analysis are presented here. "--" = no change, or species not present in sub-AA; "n/a" = no variation between module covers (non-normal distribution, does not meet assumptions of paired t-test); *p*-values in **bold*** are considered significant ($p \leq 0.05$).

Δ in Mean Cover	Sub-AA 1 (Burned Fall 2015)								
Species	2016-2017 (Percentage Point Δ)	*t*-statistic	*p*-value	2017-2018 (Percentage Point Δ)	*t*-statistic	*p*-value	2016-2018 (Percentage Point Δ)	*t*-statistic	*p*-value
Achillea millefolium	0.3	-1.73	0.18	-0.3	1.73	0.18	0.0	--	--
Agrostis exarata	--	--	--	--	--	--	--	--	--
Alopecurus pratensis	32.5	-3.27	**0.05***	7.5	-1.00	0.39	40.0	-3.14	**0.05***
Amelanchier alnifolia	--	--	--	--	--	--	--	--	--
Anthoxanthum odoratum	0.3	-1.73	0.18	0.9	-2.78	0.07	1.1	-3.00	0.06
Barbarea orthoceras	--	--	--	--	--	--	--	--	--
Bromus commutatus	0.1	-1.00	0.39	0.4	-3.00	0.06	0.5	n/a	n/a
Camassia quamash	0.0	--	--	-0.3	1.73	0.18	-0.3	1.73	0.18
Cardamine cf. oligosperma	-0.5	n/a	n/a	0.0	--	--	-0.5	n/a	n/a
Carex densa	0.5	-1.00	0.39	1.9	-1.35	0.27	2.4	-1.90	0.15
Carex obnupta	--	--	--	--	--	--	--	--	--
Carex pachystachya	0.1	-1.00	0.39	0.1	-1.00	0.39	0.3	-1.73	0.18
Carex pellita	--	--	--	--	--	--	--	--	--
Carex tumulicola	0.1	-0.52	0.64	-0.3	1.73	0.18	-0.1	1.00	0.39
Carex unilateralis	1.8	-2.05	0.13	2.3	-2.63	0.08	4.0	-5.66	**0.01***
Centaurium erythraea	-0.3	1.73	0.18	-0.1	1.00	0.39	-0.4	3.00	0.06
Cerastium fontanum ssp. vulgare	0.3	-1.73	0.18	0.3	-1.73	0.18	0.5	n/a	n/a
Cirsium arvense	-0.4	3.00	0.06	0.0	--	--	-0.4	3.00	0.06
Cirsium sp.	0.0	0.00	1.00	-0.1	1.00	0.39	-0.1	1.00	0.39
Cirsium vulgare	-0.3	1.73	0.18	0.1	-1.00	0.39	-0.1	0.52	0.64
Convolvulus arvensis	--	--	--	--	--	--	--	--	--
Crataegus douglasii	0.0	--	--	0.1	-1.00	0.39	0.1	-1.00	0.39
Crataegus monogyna var. monogyna	--	--	--	--	--	--	--	--	--
Cynosurus cristatus	--	--	--	--	--	--	--	--	--

Δ in Mean Cover	Sub-AA 1 (Burned Fall 2015)								
Species	2016-2017 (Percentage Point Δ)	*t*-statistic	*p*-value	2017-2018 (Percentage Point Δ)	*t*-statistic	*p*-value	2016-2018 (Percentage Point Δ)	*t*-statistic	*p*-value
Danthonia californica	0.0	--	--	-0.1	1.00	0.39	-0.1	1.00	0.39
Daucus carota	0.1	-1.00	0.39	-0.1	1.00	0.39	0.0	--	--
Deschampsia cespitosa	0.4	-1.57	0.22	0.9	-1.58	0.21	1.3	-1.89	0.16
Dianthus armeria	0.1	-1.00	0.39	0.1	-1.00	0.39	0.3	-1.73	0.18
Dipsacus fullonum	--	--	--	--	--	--	--	--	--
Dodecatheon sp.	-0.1	1.00	0.39	0.0	--	--	-0.1	1.00	0.39
Eleocharis acicularis	0.0	--	--	1.3	-1.67	0.19	1.3	-1.67	0.19
Eleocharis palustris	-0.1	1.00	0.39	0.1	-1.00	0.39	0.0	--	--
Epilobium brachycarpum	0.1	-1.00	0.39	0.0	--	--	0.1	-1.00	0.39
Epilobium ciliatum	-4.6	1.12	0.34	0.0	0.00	1.00	-4.6	1.12	0.34
Epilobium densiflorum	--	--	--	--	--	--	--	--	--
Epilobium sp.	0.0	0.00	1.00	-0.1	1.00	0.39	-0.1	1.00	0.39
Equisetum arvense	--	--	--	--	--	--	--	--	--
Eriophyllum lanatum	0.0	--	--	0.0	--	--	0.0	--	--
Eryngium petiolatum	--	--	--	--	--	--	--	--	--
Fraxinus latifolia	0.5	n/a	n/a	-0.1	1.00	0.39	0.4	-3.00	0.06
Galium aparine	--	--	--	--	--	--	--	--	--
Galium trifidum	18.5	-3.48	**0.04***	-13.5	2.16	0.12	5.0	-2.89	0.06
Geranium dissectum	0.1	-1.00	0.39	0.9	-1.22	0.31	1.0	-1.19	0.32
Geranium molle	-0.1	1.00	0.39	0.0	--	--	-0.1	1.00	0.39
Geum macrophyllum	0.1	-1.00	0.39	-0.1	1.00	0.39	0.0	--	--
Gnaphalium palustre	-0.3	1.73	0.18	0.0	0.00	1.00	-0.3	1.73	0.18
Gratiola ebracteata	--	--	--	--	--	--	--	--	--
Holcus lanatus	0.8	-2.32	0.10	2.3	-1.51	0.23	3.0	-1.85	0.16
Hordeum brachyantherum	--	--	--	--	--	--	--	--	--
Hypericum perforatum	0.1	-1.00	0.39	-0.3	1.73	0.18	-0.1	1.00	0.39
Hypochaeris radicata	0.0	--	--	0.0	--	--	0.0	--	--

Δ in Mean Cover	Sub-AA 1 (Burned Fall 2015)								
Species	2016-2017 (Percentage Point Δ)	*t*-statistic	*p*-value	2017-2018 (Percentage Point Δ)	*t*-statistic	*p*-value	2016-2018 (Percentage Point Δ)	*t*-statistic	*p*-value
Juncus balticus ssp. ater	-1.8	1.70	0.19	0.0	--	--	-1.8	1.70	0.19
Juncus bufonius	0.3	-0.77	0.50	-0.5	2.45	0.09	-0.3	1.73	0.18
Juncus effusus ssp. pacificus	--	--	--	--	--	--	--	--	--
Juncus tenuis	-0.1	1.00	0.39	0.1	-1.00	0.39	0.0	--	--
Lactuca serriola	0.0	--	--	0.1	-1.00	0.39	0.1	-1.00	0.39
Leucanthemum vulgare	0.1	-1.00	0.39	-0.1	1.00	0.39	0.0	--	--
Lolium persicum	--	--	--	--	--	--	--	--	--
Lomatium bradshawii	--	--	--	--	--	--	--	--	--
Lomatium sp.	0.1	-1.00	0.39	-0.1	1.00	0.39	0.0	--	--
Lotus corniculatus	--	--	--	--	--	--	--	--	--
Lotus sp.	--	--	--	--	--	--	--	--	--
Lupinus polyphyllus	--	--	--	--	--	--	--	--	--
Luzula multiflora	--	--	--	--	--	--	--	--	--
Lythrum portula	--	--	--	--	--	--	--	--	--
Madia elegans	0.4	-3.00	0.06	-0.4	3.00	0.06	0.0	--	--
Madia sativa	0.0	--	--	0.6	-1.99	0.14	0.6	-1.99	0.14
Micranthes oregana	--	--	--	--	--	--	--	--	--
Montia linearis	0.0	0.00	1.00	0.3	-1.73	0.18	0.3	-1.73	0.18
Myosotis discolor	0.0	--	--	0.1	-1.00	0.39	0.1	-1.00	0.39
Myosotis laxa	1.3	-1.32	0.28	-2.3	1.36	0.27	-1.0	1.10	0.35
Navarretia intertexta	0.1	-0.40	0.72	-0.4	1.57	0.22	-0.3	1.73	0.18
Bellardia viscosa	0.3	-1.73	0.18	0.0	--	--	0.3	-1.73	0.18
Perideridia montana	-2.1	2.43	0.09	-0.1	1.00	0.39	-2.3	3.00	0.06
Persicaria hydropiperoides	0.0	--	--	0.0	--	--	0.0	--	--
Phalaris arundinacea	0.4	-1.00	0.39	-0.3	1.00	0.39	0.1	-1.00	0.39
Plagiobothrys figuratus	0.9	-1.00	0.39	2.5	-2.61	0.08	3.4	-2.11	0.13
Plantago lanceolata	--	--	--	--	--	--	--	--	--

Δ in Mean Cover	Sub-AA 1 (Burned Fall 2015)								
Species	2016-2017 (Percentage Point Δ)	*t*-statistic	*p*-value	2017-2018 (Percentage Point Δ)	*t*-statistic	*p*-value	2016-2018 (Percentage Point Δ)	*t*-statistic	*p*-value
Poa compressa	0.1	-0.40	0.72	0.0	--	--	0.1	-0.40	0.72
Poa pratensis	4.9	-1.20	0.32	0.0	--	--	4.9	-1.20	0.32
Potentilla gracilis	-0.1	1.00	0.39	0.0	--	--	-0.1	1.00	0.39
Prunella vulgaris var. lanceolata	2.1	-1.30	0.29	0.3	-1.00	0.39	2.4	-1.54	0.22
Quercus garryana	--	--	--	--	--	--	--	--	--
Ranunculus occidentalis var. occidentalis	0.0	--	--	0.1	-1.00	0.39	0.1	-1.00	0.39
Ranunculus orthorhynchus	0.1	-1.00	0.39	-0.3	1.73	0.18	-0.1	1.00	0.39
Ranunculus sceleratus	0.0	0.00	1.00	0.0	--	--	0.0	0.00	1.00
Ranunculus uncinatus	--	--	--	--	--	--	--	--	--
Rorippa curvisiliqua	0.3	-1.73	0.18	0.3	-1.00	0.39	0.5	-2.45	0.09
Rorippa palustris	--	--	--	--	--	--	--	--	--
Rosa nutkana ssp. nutkana	-0.5	1.00	0.39	1.0	-2.45	0.09	0.5	-1.73	0.18
Rosa pisocarpa	--	--	--	--	--	--	--	--	--
Rubus bifrons	0.0	--	--	0.4	--	--	0.4	--	--
Rumex acetosella	0.1	-1.00	0.39	-0.1	1.00	0.39	0.0	--	--
Rumex crispus	0.3	-1.73	0.18	0.0	--	--	0.3	-1.73	0.18
Sanicula crassicaulis	--	--	--	--	--	--	--	--	--
Schedonorus arundinaceus	--	--	--	--	--	--	--	--	--
Jacobaea vulgaris	-0.3	1.73	0.18	0.0	--	--	-0.3	1.73	0.18
Sisyrinchium idahoense	0.4	-3.00	0.06	-0.1	1.00	0.39	0.3	-1.73	0.18
Solanum dulcamara	--	--	--	--	--	--	--	--	--
Sonchus asper	0.1	-1.00	0.39	0.0	--	--	0.1	-1.00	0.39
Spiraea douglasii	0.1	-1.00	0.39	-0.1	1.00	0.39	0.0	--	--
Symphoricarpos albus	--	--	--	--	--	--	--	--	--
Symphyotrichum sp.	0.3	-1.73	0.18	0.3	-1.73	0.18	0.5	n/a	n/a
Taraxacum officinale	0.1	-1.00	0.39	0.0	0.00	1.00	0.1	-1.00	0.39
Trifolium dubium	0.4	-3.00	0.06	0.0	--	--	0.4	-3.00	0.06

Δ in Mean Cover	Sub-AA 1 (Burned Fall 2015)								
Species	2016-2017 (Percentage Point Δ)	*t*-statistic	*p*-value	2017-2018 (Percentage Point Δ)	*t*-statistic	*p*-value	2016-2018 (Percentage Point Δ)	*t*-statistic	*p*-value
Trifolium repens	0.1	-1.00	0.39	0.0	--	--	0.1	-1.00	0.39
Trifolium sp.	-0.3	1.73	0.18	0.0	--	--	-0.3	1.73	0.18
Trifolium subterraneum	0.0	--	--	0.1	-1.00	0.39	0.1	-1.00	0.39
Triteleia hyacinthina	-0.1	1.00	0.39	0.0	--	--	-0.1	1.00	0.39
Verbascum blattaria	0.0	--	--	0.3	-1.00	0.39	0.3	-1.00	0.39
Veronica arvensis	0.0	0.00	1.00	0.1	-1.00	0.39	0.1	-1.00	0.39
Veronica peregrina var. xalapensis	-0.1	1.00	0.39	-0.1	1.00	0.39	-0.3	1.73	0.18
Veronica scutellata	0.5	-1.41	0.25	0.0	--	--	0.5	-1.41	0.25
Veronica serpyllifolia var. serpyllifolia	0.1	-1.00	0.39	0.1	-1.00	0.39	0.3	-1.73	0.18
Vicia hirsuta	--	--	--	--	--	--	--	--	--
Vicia sativa	--	--	--	--	--	--	--	--	--
Vicia tetrasperma	0.1	-1.00	0.39	0.3	-1.73	0.18	0.4	-3.00	0.06
Vulpia bromoides	0.0	--	--	0.1	-1.00	0.39	0.1	-1.00	0.39

Table D-3. Change in mean cover (percentage points), *t*-statistic, and *p*-values for each species in sub-AA 2 at Lacamas Prairie NAP from 2016-2018. Only species used in FQA analysis are presented here. -- = no change, or species not present in sub-AA; n/a = no variation between module covers (non-normal distribution, does not meet assumptions of paired t-test); *p*-values in **bold*** are considered significant ($p \leq 0.05$).

Δ in Mean Cover	Sub-AA 2 (High Quality)								
Species	2016-2017 (Percentage Point Δ)	*t*-statistic	*p*-value	2017-2018 (Percentage Point Δ)	*t*-statistic	*p*-value	2016-2018 (Percentage Point Δ)	*t*-statistic	*p*-value
Achillea millefolium	--	--	--	--	--	--	--	--	--
Agrostis exarata	0.1	-1.00	0.34	0.1	-0.43	0.68	0.1	-1.00	0.34
Alopecurus pratensis	1.8	-0.86	0.41	-2.3	0.71	0.50	-0.5	0.38	0.72
Amelanchier alnifolia	0.1	-1.50	0.17	0.1	-1.00	0.34	0.2	-1.96	0.08
Anthoxanthum odoratum	0.8	-0.97	0.36	-0.2	0.20	0.85	0.6	-0.80	0.44
Barbarea orthoceras	--	--	--	--	--	--	--	--	--
Bromus commutatus	-1.1	1.09	0.31	1.7	-1.50	0.17	0.6	-1.41	0.19
Camassia quamash	-3.8	1.01	0.34	0.1	-1.00	0.34	-3.8	1.00	0.34
Cardamine cf. oligosperma	0.0	0.00	1.00	-0.1	1.00	0.34	-0.1	0.43	0.68
Carex densa	-0.2	1.00	0.34	0.0	--	--	-0.2	1.00	0.34
Carex obnupta	0.1	-0.43	0.68	0.0	--	--	0.1	-0.43	0.68
Carex pachystachya	0.0	--	--	0.1	-1.50	0.17	0.1	-1.50	0.17
Carex pellita	0.0	--	--	0.2	-1.00	0.34	0.2	-1.00	0.34
Carex tumulicola	0.0	--	--	0.0	0.00	1.00	0.0	0.00	1.00
Carex unilateralis	0.3	-0.58	0.58	0.1	-0.43	0.68	0.4	-1.00	0.34
Centaurium erythraea	0.1	-0.43	0.68	-0.1	1.00	0.34	-0.1	0.56	0.59
Cerastium fontanum ssp. vulgare	0.1	-1.50	0.17	-0.1	1.50	0.17	0.0	0.00	1.00
Cirsium arvense	--	--	--	--	--	--	--	--	--
Cirsium sp.	0.1	-1.00	0.34	-0.1	1.00	0.34	0.0	--	--
Cirsium vulgare	0.0	--	--	0.1	-1.00	0.34	0.1	-1.00	0.34
Convolvulus arvensis	--	--	--	--	--	--	--	--	--
Crataegus douglasii	0.2	-1.96	0.08	0.1	-1.00	0.34	0.2	-2.45	**0.04***
Crataegus monogyna var. monogyna	0.0	--	--	0.1	-1.00	0.34	0.1	-1.00	0.34
Cynosurus cristatus	0.1	-1.00	0.34	0.1	-1.00	0.34	0.1	-1.50	0.17

Δ in Mean Cover	Sub-AA 2 (High Quality)								
Species	2016-2017 (Percentage Point Δ)	*t*-statistic	*p*-value	2017-2018 (Percentage Point Δ)	*t*-statistic	*p*-value	2016-2018 (Percentage Point Δ)	*t*-statistic	*p*-value
Danthonia californica	-0.5	1.96	0.08	0.0	0.00	1.00	-0.5	1.49	0.17
Daucus carota	0.0	--	--	0.1	-1.00	0.34	0.1	-1.00	0.34
Deschampsia cespitosa	7.3	-1.62	0.14	2.0	-1.50	0.17	9.3	-2.10	0.07
Dianthus armeria	-0.2	1.96	0.08	0.0	--	--	-0.2	1.96	0.08
Dipsacus fullonum	--	--	--	--	--	--	--	--	--
Dodecatheon sp.	--	--	--	--	--	--	--	--	--
Eleocharis acicularis	-0.4	1.27	0.24	0.0	0.00	1.00	-0.4	1.50	0.17
Eleocharis palustris	0.0	--	--	0.0	--	--	0.0	--	--
Epilobium brachycarpum	0.2	-1.00	0.34	0.3	-1.63	0.14	0.4	-2.06	0.07
Epilobium ciliatum	-0.4	1.11	0.30	0.1	-1.00	0.34	-0.3	0.73	0.49
Epilobium densiflorum	-0.1	1.50	0.17	0.0	--	--	-0.1	1.50	0.17
Epilobium sp.	0.0	--	--	-0.1	1.00	0.34	-0.1	1.00	0.34
Equisetum arvense	-0.1	1.00	0.34	0.0	--	--	-0.1	1.00	0.34
Eriophyllum lanatum	--	--	--	--	--	--	--	--	--
Eryngium petiolatum	-0.1	1.00	0.34	0.0	--	--	-0.1	1.00	0.34
Fraxinus latifolia	0.2	-1.96	0.08	0.0	0.00	1.00	0.2	-1.41	0.19
Galium aparine	--	--	--	--	--	--	--	--	--
Galium trifidum	16.3	-2.75	**0.02***	-4.0	1.11	0.30	12.3	-2.36	**0.04***
Geranium dissectum	0.0	--	--	0.0	--	--	0.0	--	--
Geranium molle	--	--	--	--	--	--	--	--	--
Geum macrophyllum	0.1	-1.00	0.34	0.0	--	--	0.1	-1.00	0.34
Gnaphalium palustre	-0.1	1.50	0.17	0.0	--	--	-0.1	1.50	0.17
Gratiola ebracteata	0.1	-1.00	0.34	0.0	--	--	0.1	-1.00	0.34
Holcus lanatus	-1.5	0.90	0.39	-0.4	1.00	0.34	-1.9	1.14	0.28
Hordeum brachyantherum	0.0	--	--	-0.1	1.00	0.34	-0.1	1.00	0.34
Hypericum perforatum	--	--	--	--	--	--	--	--	--
Hypochaeris radicata	-0.1	1.50	0.17	0.4	-1.56	0.15	0.3	-1.05	0.32

Δ in Mean Cover	Sub-AA 2 (High Quality)								
Species	2016-2017 (Percentage Point Δ)	*t*-statistic	*p*-value	2017-2018 (Percentage Point Δ)	*t*-statistic	*p*-value	2016-2018 (Percentage Point Δ)	*t*-statistic	*p*-value
Juncus balticus ssp. ater	--	--	--	--	--	--	--	--	--
Juncus bufonius	0.1	-1.00	0.34	-0.1	1.00	0.34	0.0	--	--
Juncus effusus ssp. pacificus	0.1	-1.00	0.34	-0.1	1.00	0.34	0.0	--	--
Juncus tenuis	-0.2	0.45	0.66	-0.4	1.81	0.10	-0.6	1.72	0.12
Lactuca serriola	--	--	--	--	--	--	--	--	--
Leucanthemum vulgare	-0.2	0.80	0.44	-0.1	1.00	0.34	-0.3	1.41	0.19
Lolium persicum	--	--	--	--	--	--	--	--	--
Lomatium bradshawii	0.0	--	--	0.0	--	--	0.0	--	--
Lomatium sp.	--	--	--	--	--	--	--	--	--
Lotus corniculatus	0.3	-0.81	0.44	0.0	--	--	0.3	-0.81	0.44
Lotus sp.	--	--	--	--	--	--	--	--	--
Lupinus polyphyllus	0.1	-1.00	0.34	-0.1	1.00	0.34	0.0	0.00	1.00
Luzula multiflora	0.0	--	--	0.1	-1.00	0.34	0.1	-1.00	0.34
Lythrum portula	--	--	--	--	--	--	--	--	--
Madia elegans	0.0	--	--	0.1	-1.50	0.17	0.1	-1.50	0.17
Madia sativa	-0.1	1.50	0.17	0.3	-3.00	**0.01***	0.2	-1.96	0.08
Micranthes oregana	--	--	--	--	--	--	--	--	--
Montia linearis	0.1	-1.00	0.34	0.0	0.00	1.00	0.1	-1.00	0.34
Myosotis discolor	0.1	-0.56	0.59	0.1	-1.00	0.34	0.1	-1.50	0.17
Myosotis laxa	-1.2	0.61	0.56	-0.3	0.26	0.80	-1.5	1.27	0.24
Navarretia intertexta	-0.1	1.00	0.34	0.0	0.00	1.00	-0.1	0.56	0.59
Bellardia viscosa	0.3	-3.00	**0.01***	-0.1	1.50	0.17	0.2	-1.41	0.19
Perideridia montana	0.2	-2.45	**0.04***	0.0	0.00	1.00	0.2	-2.45	**0.04***
Persicaria hydropiperoides	-0.3	1.63	0.14	0.0	--	--	-0.3	1.63	0.14
Phalaris arundinacea	0.2	-1.96	0.08	-0.1	1.50	0.17	0.1	-1.00	0.34
Plagiobothrys figuratus	-0.3	1.77	0.11	0.4	-2.45	**0.04***	0.1	-0.45	0.66
Plantago lanceolata	-0.1	1.50	0.17	0.0	0.00	1.00	-0.1	1.50	0.17

Δ in Mean Cover	Sub-AA 2 (High Quality)								
Species	2016-2017 (Percentage Point Δ)	*t*-statistic	*p*-value	2017-2018 (Percentage Point Δ)	*t*-statistic	*p*-value	2016-2018 (Percentage Point Δ)	*t*-statistic	*p*-value
Poa compressa	0.1	-1.00	0.34	0.0	--	--	0.1	-1.00	0.34
Poa pratensis	0.3	-0.68	0.51	0.1	-0.29	0.78	0.4	-0.84	0.42
Potentilla gracilis	0.1	-1.50	0.17	-0.1	1.00	0.34	0.1	-1.00	0.34
Prunella vulgaris var. lanceolata	0.5	-1.22	0.25	-0.2	0.94	0.37	0.3	-0.80	0.44
Quercus garryana	--	--	--	--	--	--	--	--	--
Ranunculus occidentalis var. occidentalis	-0.2	1.41	0.19	0.0	0.00	1.00	-0.2	1.41	0.19
Ranunculus orthorhynchus	0.1	-1.00	0.34	0.0	--	--	0.1	-1.00	0.34
Ranunculus sceleratus	--	--	--	--	--	--	--	--	--
Ranunculus uncinatus	--	--	--	--	--	--	--	--	--
Rorippa curvisiliqua	-0.2	2.45	**0.04***	0.2	-1.41	0.19	-0.1	0.43	0.68
Rorippa palustris	-0.1	1.00	0.34	0.0	--	--	-0.1	1.00	0.34
Rosa nutkana ssp. nutkana	0.2	-1.15	0.28	0.3	-0.97	0.36	0.5	-1.49	0.17
Rosa pisocarpa	0.1	-1.00	0.34	-0.1	1.50	0.17	-0.1	1.00	0.34
Rubus bifrons	-0.1	1.00	0.34	0.0	--	--	-0.1	1.00	0.34
Rumex acetosella	-0.1	1.00	0.34	0.0	--	--	-0.1	1.00	0.34
Rumex crispus	-0.1	0.43	0.68	-0.1	1.50	0.17	-0.2	1.41	0.19
Sanicula crassicaulis	--	--	--	--	--	--	--	--	--
Schedonorus arundinaceus	-0.4	1.00	0.34	-0.1	1.00	0.34	-0.5	1.13	0.29
Jacobaea vulgaris	-0.1	1.50	0.17	-0.1	1.00	0.34	-0.2	2.45	**0.04***
Sisyrinchium idahoense	-0.1	1.50	0.17	-0.2	1.96	0.08	-0.3	3.00	**0.01***
Solanum dulcamara	0.0	--	--	-0.1	1.00	0.34	-0.1	1.00	0.34
Sonchus asper	-0.1	1.00	0.34	0.0	--	--	-0.1	1.00	0.34
Spiraea douglasii	--	--	--	--	--	--	--	--	--
Symphoricarpos albus	0.0	0.00	1.00	0.0	--	--	0.0	0.00	1.00
Symphyotrichum sp.	-0.4	1.31	0.22	0.0	--	--	-0.4	1.31	0.22
Taraxacum officinale	0.0	--	--	0.0	--	--	0.0	--	--
Trifolium dubium	0.1	-1.50	0.17	-0.1	1.50	0.17	0.0	--	--

Δ in Mean Cover	Sub-AA 2 (High Quality)								
Species	2016-2017 (Percentage Point Δ)	*t*-statistic	*p*-value	2017-2018 (Percentage Point Δ)	*t*-statistic	*p*-value	2016-2018 (Percentage Point Δ)	*t*-statistic	*p*-value
Trifolium repens	--	--	--	--	--	--	--	--	--
Trifolium sp.	--	--	--	--	--	--	--	--	--
Trifolium subterraneum	--	--	--	--	--	--	--	--	--
Triteleia hyacinthina	--	--	--	--	--	--	--	--	--
Verbascum blattaria	--	--	--	--	--	--	--	--	--
Veronica arvensis	0.0	0.00	1.00	-0.1	1.50	0.17	-0.1	1.00	0.34
Veronica peregrina var. xalapensis	0.0	--	--	0.1	-1.00	0.34	0.1	-1.00	0.34
Veronica scutellata	0.3	-1.10	0.30	0.0	--	--	0.3	-1.10	0.30
Veronica serpyllifolia var. serpyllifolia	0.1	-1.50	0.17	0.2	-1.41	0.19	0.3	-3.00	**0.01***
Vicia hirsuta	0.1	-1.50	0.17	0.0	0.00	1.00	0.1	-1.50	0.17
Vicia sativa	-0.1	1.00	0.34	0.1	-1.00	0.34	0.0	--	--
Vicia tetrasperma	0.0	0.00	1.00	0.1	-1.50	0.17	0.1	-1.50	0.17
Vulpia bromoides	--	--	--	--	--	--	--	--	--

Table D-4. Change in mean cover (percentage points), *t*-statistic, and *p*-values for each species in sub-AA 3 at Lacamas Prairie NAP from 2016-2018. Only species used in FQA analysis are presented here. -- = no change, or species not present in sub-AA; n/a = no variation between module covers (non-normal distribution, does not meet assumptions of paired t-test); *p*-values in **bold*** are considered significant ($p \leq 0.05$).

Δ in Mean Cover	Sub-AA 3 (Burned Fall 2016)								
Species	2016-2017 (Percentage Point Δ)	*t*-statistic	*p*-value	2017-2018 (Percentage Point Δ)	*t*-statistic	*p*-value	2016-2018 (Percentage Point Δ)	*t*-statistic	*p*-value
Achillea millefolium	0.5	n/a	n/a	0.0	--	--	0.5	n/a	n/a
Agrostis exarata	--	--	--	--	--	--	--	--	--
Alopecurus pratensis	-48.4	3.77	**0.02***	2.0	-0.65	0.55	-46.4	4.03	**0.02***
Amelanchier alnifolia	--	--	--	--	--	--	--	--	--
Anthoxanthum odoratum	-7.8	1.07	0.35	1.6	-3.14	**0.03***	-6.2	0.83	0.45
Barbarea orthoceras	0.3	-2.45	0.07	0.2	-1.63	0.18	0.5	n/a	n/a
Bromus commutatus	-12.6	1.87	0.13	0.5	-1.83	0.14	-12.1	1.76	0.15
Camassia quamash	0.2	-1.00	0.37	-0.2	1.00	0.37	0.0	--	--
Cardamine cf. oligosperma	-0.1	1.00	0.37	0.0	--	--	-0.1	1.00	0.37
Carex densa	-0.4	0.59	0.59	0.2	-1.00	0.37	-0.2	0.41	0.70
Carex obnupta	--	--	--	--	--	--	--	--	--
Carex pachystachya	0.2	-1.00	0.37	0.0	--	--	0.2	-1.00	0.37
Carex pellita	--	--	--	--	--	--	--	--	--
Carex tumulicola	0.0	--	--	0.0	--	--	0.0	--	--
Carex unilateralis	-0.7	0.67	0.54	1.5	-1.46	0.22	0.8	-0.78	0.48
Centaurium erythraea	0.0	--	--	0.1	-1.00	0.37	0.1	-1.00	0.37
Cerastium fontanum ssp. vulgare	0.1	-1.00	0.37	0.4	-2.14	0.10	0.5	-3.16	**0.03***
Cirsium arvense	0.1	-1.00	0.37	0.1	-1.00	0.37	0.2	-1.63	0.18
Cirsium sp.	--	--	--	--	--	--	--	--	--
Cirsium vulgare	0.1	-1.00	0.37	0.2	-1.63	0.18	0.3	-2.45	0.07
Convolvulus arvensis	0.0	--	--	0.3	-1.50	0.21	0.3	-1.50	0.21
Crataegus douglasii	-0.1	0.53	0.62	0.1	-1.00	0.37	0.0	0.00	1.00
Crataegus monogyna var. monogyna	0.0	--	--	0.1	-1.00	0.37	0.1	-1.00	0.37
Cynosurus cristatus	--	--	--	--	--	--	--	--	--

Δ in Mean Cover	Sub-AA 3 (Burned Fall 2016)								
Species	2016-2017 (Percentage Point Δ)	*t*-statistic	*p*-value	2017-2018 (Percentage Point Δ)	*t*-statistic	*p*-value	2016-2018 (Percentage Point Δ)	*t*-statistic	*p*-value
Danthonia californica	--	--	--	--	--	--	--	--	--
Daucus carota	0.1	-1.00	0.37	0.1	-1.00	0.37	0.2	-1.63	0.18
Deschampsia cespitosa	0.9	-2.25	0.09	3.4	-2.72	0.05	4.3	-2.73	0.05
Dianthus armeria	0.0	--	--	0.1	-1.00	0.37	0.1	-1.00	0.37
Dipsacus fullonum	0.0	--	--	0.1	-1.00	0.37	0.1	-1.00	0.37
Dodecatheon sp.	--	--	--	--	--	--	--	--	--
Eleocharis acicularis	0.0	--	--	0.1	-1.00	0.37	0.1	-1.00	0.37
Eleocharis palustris	--	--	--	--	--	--	--	--	--
Epilobium brachycarpum	0.2	-1.63	0.18	0.1	-1.00	0.37	0.3	-2.45	0.07
Epilobium ciliatum	0.6	-2.06	0.11	-0.5	2.24	0.09	0.1	-1.00	0.37
Epilobium densiflorum	0.1	-1.00	0.37	-0.1	1.00	0.37	0.0	--	--
Epilobium sp.	-0.1	1.00	0.37	0.1	-1.00	0.37	0.0	0.00	1.00
Equisetum arvense	--	--	--	--	--	--	--	--	--
Eriophyllum lanatum	0.3	-2.45	0.07	0.2	-1.63	0.18	0.5	n/a	n/a
Eryngium petiolatum	--	--	--	--	--	--	--	--	--
Fraxinus latifolia	-0.1	0.41	0.70	-3.4	1.00	0.37	-3.5	1.03	0.36
Galium aparine	0.2	-0.59	0.59	-0.3	1.50	0.21	-0.1	0.53	0.62
Galium trifidum	0.4	-0.59	0.59	3.6	-1.35	0.25	4.0	-1.22	0.29
Geranium dissectum	-4.8	1.54	0.20	9.0	-2.55	0.06	4.2	-0.80	0.47
Geranium molle	0.2	-1.63	0.18	-0.1	0.53	0.62	0.1	-1.00	0.37
Geum macrophyllum	0.0	--	--	0.0	--	--	0.0	--	--
Gnaphalium palustre	0.4	-4.00	**0.02***	0.0	--	--	0.4	-4.00	**0.02***
Gratiola ebracteata	0.2	-1.63	0.18	0.1	-1.00	0.37	0.3	-2.45	0.07
Holcus lanatus	-2.0	1.77	0.15	1.9	-1.82	0.14	-0.1	0.20	0.85
Hordeum brachyantherum	--	--	--	--	--	--	--	--	--
Hypericum perforatum	0.1	-1.00	0.37	-0.3	2.45	0.07	-0.2	1.63	0.18
Hypochaeris radicata	-0.1	1.00	0.37	0.3	-2.45	0.07	0.2	-1.63	0.18

Δ in Mean Cover	Sub-AA 3 (Burned Fall 2016)								
Species	2016-2017 (Percentage Point Δ)	*t*-statistic	*p*-value	2017-2018 (Percentage Point Δ)	*t*-statistic	*p*-value	2016-2018 (Percentage Point Δ)	*t*-statistic	*p*-value
Juncus balticus ssp. ater	0.0	--	--	-0.8	1.43	0.23	-0.8	1.43	0.23
Juncus bufonius	1.2	-2.45	0.07	-0.9	1.62	0.18	0.3	-2.45	0.07
Juncus effusus ssp. pacificus	-0.1	1.00	0.37	0.0	--	--	-0.1	1.00	0.37
Juncus tenuis	0.2	-1.00	0.37	0.0	0.00	1.00	0.2	-1.00	0.37
Lactuca serriola	0.1	-1.00	0.37	0.3	-2.45	0.07	0.4	-4.00	**0.02***
Leucanthemum vulgare	12.9	-1.01	0.37	3.7	-1.07	0.34	16.6	-1.02	0.36
Lolium persicum	0.0	--	--	0.1	-1.00	0.37	0.1	-1.00	0.37
Lomatium bradshawii	0.1	-1.00	0.37	0.0	0.00	1.00	0.1	-1.00	0.37
Lomatium sp.	--	--	--	--	--	--	--	--	--
Lotus corniculatus	0.1	-1.00	0.37	-0.1	1.00	0.37	0.0	--	--
Lotus sp.	-0.1	1.00	0.37	0.0	--	--	-0.1	1.00	0.37
Lupinus polyphyllus	0.4	-4.00	**0.02***	-0.3	2.45	0.07	0.1	-1.00	0.37
Luzula multiflora	--	--	--	--	--	--	--	--	--
Lythrum portula	0.1	-1.00	0.37	-0.1	1.00	0.37	0.0	--	--
Madia elegans	0.2	-1.63	0.18	0.2	-1.00	0.37	0.4	-1.37	0.24
Madia sativa	0.0	--	--	0.3	-2.45	0.07	0.3	-2.45	0.07
Micranthes oregana	0.1	-1.00	0.37	0.0	--	--	0.1	-1.00	0.37
Montia linearis	0.1	-1.00	0.37	0.6	-2.06	0.11	0.7	-2.06	0.11
Myosotis discolor	1.6	-1.18	0.30	-1.4	0.92	0.41	0.2	-1.00	0.37
Myosotis laxa	0.0	0.00	1.00	0.6	-2.45	0.07	0.6	-2.45	0.07
Navarretia intertexta	0.1	-1.00	0.37	0.2	-1.63	0.18	0.3	-2.45	0.07
Bellardia viscosa	0.5	-1.83	0.14	-0.1	0.41	0.70	0.4	-4.00	**0.02***
Perideridia montana	16.2	-0.99	0.38	-16.9	1.05	0.35	-0.7	1.20	0.30
Persicaria hydropiperoides	--	--	--	--	--	--	--	--	--
Phalaris arundinacea	--	--	--	--	--	--	--	--	--
Plagiobothrys figuratus	0.7	-5.72	**<0.01***	3.5	-2.57	0.06	4.2	-3.04	**0.04***
Plantago lanceolata	-0.1	1.00	0.37	0.2	-1.63	0.18	0.1	-1.00	0.37

Δ in Mean Cover	Sub-AA 3 (Burned Fall 2016)								
Species	2016-2017 (Percentage Point Δ)	*t*-statistic	*p*-value	2017-2018 (Percentage Point Δ)	*t*-statistic	*p*-value	2016-2018 (Percentage Point Δ)	*t*-statistic	*p*-value
Poa compressa	0.1	-1.00	0.37	0.0	--	--	0.1	-1.00	0.37
Poa pratensis	-1.7	3.16	**0.03***	0.8	-2.36	0.08	-0.9	1.11	0.33
Potentilla gracilis	0.3	-2.45	0.07	0.3	-1.18	0.30	0.6	-2.45	0.07
Prunella vulgaris var. lanceolata	0.0	0.00	1.00	1.9	-1.49	0.21	1.9	-1.46	0.22
Quercus garryana	0.1	-1.00	0.37	-0.1	1.00	0.37	0.0	--	--
Ranunculus occidentalis var. occidentalis	0.3	-2.45	0.07	0.0	--	--	0.3	-2.45	0.07
Ranunculus orthorhynchus	0.4	-1.37	0.24	0.1	-0.41	0.70	0.5	-1.58	0.19
Ranunculus sceleratus	0.5	n/a	n/a	-0.3	2.45	0.07	0.2	-1.63	0.18
Ranunculus uncinatus	0.0	0.00	1.00	-0.1	1.00	0.37	-0.1	1.00	0.37
Rorippa curvisiliqua	-0.1	0.41	0.70	1.0	-1.83	0.14	0.9	-1.62	0.18
Rorippa palustris	--	--	--	--	--	--	--	--	--
Rosa nutkana ssp. nutkana	-0.4	1.00	0.37	1.5	-1.32	0.26	1.1	-1.47	0.22
Rosa pisocarpa	--	--	--	--	--	--	--	--	--
Rubus bifrons	0.1	-1.00	0.37	0.1	1.00	0.37	0.2	--	--
Rumex acetosella	0.0	0.00	1.00	-0.2	1.00	0.37	-0.2	1.00	0.37
Rumex crispus	-0.2	1.63	0.18	0.2	-1.63	0.18	0.0	0.00	1.00
Sanicula crassicaulis	0.0	--	--	0.0	--	--	0.0	--	--
Schedonorus arundinaceus	-0.1	1.00	0.37	-0.1	1.00	0.37	-0.2	1.63	0.18
Jacobaea vulgaris	-0.2	1.63	0.18	0.1	-1.00	0.37	-0.1	1.00	0.37
Sisyrinchium idahoense	0.3	-2.45	0.07	0.0	--	--	0.3	-2.45	0.07
Solanum dulcamara	--	--	--	--	--	--	--	--	--
Sonchus asper	0.2	-1.63	0.18	0.2	-1.63	0.18	0.4	-4.00	**0.02***
Spiraea douglasii	0.0	--	--	0.1	-1.00	0.37	0.1	-1.00	0.37
Symphoricarpos albus	-0.4	1.00	0.37	0.4	-1.00	0.37	0.0	--	--
Symphyotrichum sp.	0.1	-1.00	0.37	0.4	-2.14	0.10	0.5	-3.16	**0.03***
Taraxacum officinale	0.1	-1.00	0.37	0.2	-1.63	0.18	0.3	-2.45	0.07
Trifolium dubium	0.2	-1.63	0.18	0.7	-2.75	0.05	0.9	-3.67	**0.02***

Δ in Mean Cover	Sub-AA 3 (Burned Fall 2016)								
Species	2016-2017 (Percentage Point Δ)	*t*-statistic	*p*-value	2017-2018 (Percentage Point Δ)	*t*-statistic	*p*-value	2016-2018 (Percentage Point Δ)	*t*-statistic	*p*-value
Trifolium repens	0.0	0.00	1.00	0.1	-1.00	0.37	0.1	-0.53	0.62
Trifolium sp.	--	--	--	--	--	--	--	--	--
Trifolium subterraneum	0.0	--	--	3.2	-2.54	0.06	3.2	-2.54	0.06
Triteleia hyacinthina	--	--	--	--	--	--	--	--	--
Verbascum blattaria	--	--	--	--	--	--	--	--	--
Veronica arvensis	0.1	-1.00	0.37	0.0	0.00	1.00	0.1	-0.53	0.62
Veronica peregrina var. xalapensis	0.6	-2.45	0.07	-0.1	0.41	0.70	0.5	n/a	n/a
Veronica scutellata	--	--	--	--	--	--	--	--	--
Veronica serpyllifolia var. serpyllifolia	0.2	-1.63	0.18	-0.1	1.00	0.37	0.1	-1.00	0.37
Vicia hirsuta	-0.2	1.00	0.37	2.0	-1.45	0.22	1.8	-1.33	0.26
Vicia sativa	-0.2	1.63	0.18	0.4	-1.37	0.24	0.2	-1.00	0.37
Vicia tetrasperma	0.0	--	--	1.0	-1.83	0.14	1.0	-1.83	0.14
Vulpia bromoides	--	--	--	--	--	--	--	--	--

Table D-5. Change in mean cover (percentage points), *t*-statistic, and *p*-values for each species across the full AA at Lacamas Prairie NAP from 2016-2018. Only species used in FQA analysis are presented here. "--" = no change, or species not present in sub-AA; "n/a" = no variation between module covers (non-normal distribution, does not meet assumptions of paired t-test); *p*-values in **bold*** are considered significant ($p \leq 0.05$).

Δ in Mean Cover	Full AA								
Species	2016-2017 (Percentage Point Δ)	*t*-statistic	*p*-value	2017-2018 (Percentage Point Δ)	*t*-statistic	*p*-value	2016-2018 (Percentage Point Δ)	*t*-statistic	*p*-value
Achillea millefolium	0.2	-3.24	**<0.01***	-0.1	1.46	0.16	0.1	-2.54	**0.02**
Agrostis exarata	0.0	-1.00	0.33	0.0	-0.44	0.67	0.1	-1.00	0.33
Alopecurus pratensis	-5.0	0.64	0.53	0.9	-0.38	0.71	-4.1	0.51	0.62
Amelanchier alnifolia	0.1	-1.46	0.16	0.0	-1.00	0.33	0.1	-1.84	0.08
Anthoxanthum odoratum	-1.6	0.80	0.43	0.5	-1.17	0.26	-1.1	0.54	0.59
Barbarea orthoceras	0.1	-1.84	0.08	0.1	-1.46	0.16	0.1	-2.54	**0.02**
Bromus commutatus	-3.9	1.83	0.08	1.1	-1.84	0.08	-2.8	1.31	0.21
Camassia quamash	-1.9	0.99	0.34	-0.1	1.14	0.27	-2.0	1.03	0.32
Cardamine cf. oligosperma	-0.1	1.56	0.14	0.0	1.00	0.33	-0.2	2.05	0.06
Carex densa	-0.1	0.46	0.65	0.4	-1.41	0.18	0.3	-0.91	0.37
Carex obnupta	0.0	-0.44	0.67	0.0	--	--	0.0	-0.44	0.67
Carex pachystachya	0.1	-1.37	0.19	0.1	-1.84	0.08	0.2	-2.36	**0.03**
Carex pellita	0.0	--	--	0.1	-1.00	0.33	0.1	-1.00	0.33
Carex tumulicola	0.0	-0.57	0.58	-0.1	1.00	0.33	0.0	0.57	0.58
Carex unilateralis	0.3	-0.75	0.46	0.9	-2.41	**0.03**	1.2	-2.60	**0.02**
Centaurium erythraea	0.0	0.37	0.72	-0.1	0.81	0.43	-0.1	1.14	0.27
Cerastium fontanum ssp. vulgare	0.1	-2.54	**0.02***	0.1	-1.29	0.21	0.2	-2.96	**0.01**
Cirsium arvense	-0.1	1.00	0.33	0.0	-1.00	0.33	0.0	0.44	0.67
Cirsium sp.	0.0	-0.57	0.58	-0.1	1.46	0.16	0.0	1.00	0.33
Cirsium vulgare	0.0	0.57	0.58	0.1	-2.19	**0.04**	0.1	-1.14	0.27
Convolvulus arvensis	0.0	--	--	0.1	-1.37	0.19	0.1	-1.37	0.19
Crataegus douglasii	0.1	-0.81	0.43	0.1	-1.84	0.08	0.1	-2.04	0.06
Crataegus monogyna var. monogyna	0.0	--	--	0.1	-1.37	0.19	0.1	-1.37	0.19
Cynosurus cristatus	0.0	-1.00	0.33	0.0	-1.00	0.33	0.1	-1.46	0.16

Δ in Mean Cover	Full AA								
Species	2016-2017 (Percentage Point Δ)	*t*-statistic	*p*-value	2017-2018 (Percentage Point Δ)	*t*-statistic	*p*-value	2016-2018 (Percentage Point Δ)	*t*-statistic	*p*-value
Danthonia californica	-0.2	1.84	0.08	0.0	0.37	0.72	-0.3	1.61	0.13
Daucus carota	0.1	-1.46	0.16	0.0	-0.57	0.58	0.1	-1.84	0.08
Deschampsia cespitosa	4.1	-1.71	0.11	2.1	-2.72	**0.01**	6.3	-2.58	**0.02**
Dianthus armeria	-0.1	1.00	0.33	0.1	-1.46	0.16	0.0	0.00	1.00
Dipsacus fullonum	0.0	--	--	0.0	-1.00	0.33	0.0	-1.00	0.33
Dodecatheon sp.	0.0	1.00	0.33	0.0	--	--	0.0	1.00	0.33
Eleocharis acicularis	-0.2	1.25	0.23	0.3	-1.26	0.23	0.1	-0.32	0.75
Eleocharis palustris	0.0	1.00	0.33	0.0	-1.00	0.33	0.0	--	--
Epilobium brachycarpum	0.2	-1.84	0.08	0.2	-1.84	0.08	0.3	-2.88	**0.01**
Epilobium ciliatum	-1.0	1.10	0.29	-0.1	0.77	0.45	-1.1	1.19	0.25
Epilobium densiflorum	0.0	0.57	0.58	0.0	1.00	0.33	-0.1	1.46	0.16
Epilobium sp.	0.0	0.57	0.58	0.0	0.57	0.58	-0.1	1.00	0.33
Equisetum arvense	0.0	1.00	0.33	0.0	--	--	0.0	1.00	0.33
Eriophyllum lanatum	0.1	-1.84	0.08	0.1	-1.46	0.16	0.1	-2.54	**0.02**
Eryngium petiolatum	0.0	1.00	0.33	0.0	--	--	0.0	1.00	0.33
Fraxinus latifolia	0.2	-1.84	0.08	-0.9	1.03	0.32	-0.8	0.84	0.41
Galium aparine	0.1	-0.62	0.54	-0.1	1.37	0.19	0.0	0.57	0.58
Galium trifidum	12.6	-3.46	**<0.01***	-4.0	1.50	0.15	8.6	-2.90	**0.01**
Geranium dissectum	-1.2	1.36	0.19	2.6	-2.03	0.06	1.3	-0.98	0.34
Geranium molle	0.0	-0.57	0.58	0.0	0.57	0.58	0.0	0.00	1.00
Geum macrophyllum	0.1	-1.46	0.16	0.0	1.00	0.33	0.0	-1.00	0.33
Gnaphalium palustre	0.0	0.00	1.00	0.0	0.00	1.00	0.0	0.00	1.00
Gratiola ebracteata	0.1	-1.84	0.08	0.0	-1.00	0.33	0.1	-2.19	**0.04**
Holcus lanatus	-1.1	1.26	0.23	0.8	-1.47	0.16	-0.4	0.37	0.72
Hordeum brachyantherum	0.0	--	--	0.0	1.00	0.33	0.0	1.00	0.33
Hypericum perforatum	0.1	-1.46	0.16	-0.1	2.54	**0.02**	-0.1	1.84	0.08
Hypochaeris radicata	-0.1	1.84	0.08	0.3	-2.14	**0.05**	0.2	-1.44	0.17

Δ in Mean Cover	Full AA								
Species	2016-2017 (Percentage Point Δ)	*t*-statistic	*p*-value	2017-2018 (Percentage Point Δ)	*t*-statistic	*p*-value	2016-2018 (Percentage Point Δ)	*t*-statistic	*p*-value
Juncus balticus ssp. ater	-0.4	1.44	0.17	-0.2	1.32	0.20	-0.6	2.02	0.06
Juncus bufonius	0.4	-2.33	**0.03***	-0.4	2.33	**0.03**	0.0	-0.44	0.67
Juncus effusus ssp. pacificus	0.0	0.00	1.00	0.0	1.00	0.33	0.0	1.00	0.33
Juncus tenuis	-0.1	0.29	0.78	-0.2	1.24	0.23	-0.2	1.25	0.23
Lactuca serriola	0.0	-1.00	0.33	0.1	-2.19	**0.04**	0.1	-2.54	**0.02**
Leucanthemum vulgare	3.3	-0.98	0.34	0.9	-0.97	0.35	4.2	-0.98	0.34
Lolium persicum	0.0	--	--	0.0	-1.00	0.33	0.0	-1.00	0.33
Lomatium bradshawii	0.0	-1.00	0.33	0.0	0.00	1.00	0.0	-1.00	0.33
Lomatium sp.	0.0	-1.00	0.33	0.0	1.00	0.33	0.0	--	--
Lotus corniculatus	0.2	-0.97	0.34	0.0	1.00	0.33	0.1	-0.81	0.43
Lotus sp.	0.0	1.00	0.33	0.0	--	--	0.0	1.00	0.33
Lupinus polyphyllus	0.1	-2.54	**0.02***	-0.1	2.19	**0.04**	0.0	-0.57	0.58
Luzula multiflora	0.0	--	--	0.0	-1.00	0.33	0.0	-1.00	0.33
Lythrum portula	0.0	-1.00	0.33	0.0	1.00	0.33	0.0	--	--
Madia elegans	0.1	-2.54	**0.02***	0.0	-0.33	0.75	0.2	-1.84	0.08
Madia sativa	-0.1	1.46	0.16	0.3	-3.98	**0.00**	0.3	-3.28	**0.00**
Micranthes oregana	0.0	-1.00	0.33	0.0	--	--	0.0	-1.00	0.33
Montia linearis	0.1	-1.14	0.27	0.2	-2.04	0.06	0.3	-2.48	**0.02**
Myosotis discolor	0.4	-1.21	0.24	-0.3	0.79	0.44	0.1	-2.04	0.06
Myosotis laxa	-0.3	0.34	0.74	-0.5	0.67	0.51	-0.8	1.26	0.22
Navarretia intertexta	0.0	-0.37	0.72	0.0	0.33	0.75	0.0	0.00	1.00
Bellardia viscosa	0.3	-3.62	**<0.01***	-0.1	1.14	0.27	0.2	-3.38	**0.00**
Perideridia montana	3.9	-0.91	0.38	-4.5	1.05	0.31	-0.6	1.82	0.09
Persicaria hydropiperoides	-0.1	1.56	0.14	0.0	--	--	-0.1	1.56	0.14
Phalaris arundinacea	0.2	-1.84	0.08	-0.1	1.71	0.10	0.1	-1.46	0.16
Plagiobothrys figuratus	0.2	-0.93	0.37	1.7	-3.31	**0.00**	1.9	-2.91	**0.01**
Plantago lanceolata	-0.1	1.84	0.08	0.1	-1.00	0.33	0.0	0.57	0.58

Δ in Mean Cover	Full AA								
Species	2016-2017 (Percentage Point Δ)	*t*-statistic	*p*-value	2017-2018 (Percentage Point Δ)	*t*-statistic	*p*-value	2016-2018 (Percentage Point Δ)	*t*-statistic	*p*-value
Poa compressa	0.1	-1.14	0.27	0.0	--	--	0.1	-1.14	0.27
Poa pratensis	0.7	-0.76	0.46	0.2	-1.63	0.12	1.0	-1.03	0.32
Potentilla gracilis	0.1	-1.71	0.10	0.1	-0.70	0.49	0.2	-1.68	0.11
Prunella vulgaris var. lanceolata	0.7	-1.72	0.10	0.4	-1.14	0.27	1.2	-2.24	**0.04***
Quercus garryana	0.0	-1.00	0.33	0.0	1.00	0.33	0.0	--	--
Ranunculus occidentalis var. occidentalis	0.0	0.00	1.00	0.0	-0.57	0.58	0.0	-0.33	0.75
Ranunculus orthorhynchus	0.2	-1.84	0.08	0.0	0.37	0.72	0.1	-1.32	0.20
Ranunculus sceleratus	0.1	-2.04	0.06	-0.1	1.84	0.08	0.1	-1.00	0.33
Ranunculus uncinatus	0.0	0.00	1.00	0.0	1.00	0.33	0.0	1.00	0.33
Rorippa curvisiliqua	-0.1	0.90	0.38	0.4	-2.28	**0.04***	0.3	-1.75	0.10
Rorippa palustris	0.0	1.00	0.33	0.0	--	--	0.0	1.00	0.33
Rosa nutkana ssp. nutkana	-0.1	0.79	0.44	0.8	-2.19	**0.04***	0.6	-2.49	**0.02***
Rosa pisocarpa	0.0	-1.00	0.33	-0.1	1.46	0.16	0.0	1.00	0.33
Rubus bifrons	0.0	0.00	1.00	0.1	1.00	0.33	0.1	1.00	0.33
Rumex acetosella	0.0	0.00	1.00	-0.1	1.37	0.19	-0.1	1.37	0.19
Rumex crispus	0.0	0.33	0.75	0.0	0.00	1.00	0.0	0.33	0.75
Sanicula crassicaulis	0.0	--	--	0.0	--	--	0.0	--	--
Schedonorus arundinaceus	-0.2	1.12	0.28	-0.1	1.46	0.16	-0.3	1.38	0.19
Jacobaea vulgaris	-0.2	2.88	**0.01***	0.0	0.44	0.67	-0.2	3.24	**<0.01***
Sisyrinchium idahoense	0.1	-1.46	0.16	-0.1	2.19	**0.04***	0.0	0.00	1.00
Solanum dulcamara	0.0	--	--	0.0	1.00	0.33	0.0	1.00	0.33
Sonchus asper	0.1	-1.00	0.33	0.1	-1.46	0.16	0.1	-1.71	0.10
Spiraea douglasii	0.0	-1.00	0.33	0.0	0.00	1.00	0.0	-1.00	0.33
Symphoricarpos albus	-0.1	0.94	0.36	0.1	-1.00	0.33	0.0	0.00	1.00
Symphyotrichum sp.	-0.1	0.75	0.46	0.2	-2.36	**0.03***	0.0	-0.14	0.89
Taraxacum officinale	0.1	-1.46	0.16	0.1	-1.00	0.33	0.1	-2.19	**0.04***
Trifolium dubium	0.2	-3.24	**<0.01***	0.1	-1.23	0.23	0.3	-2.88	**0.01***

Δ in Mean Cover	Full AA								
Species	2016-2017 (Percentage Point Δ)	*t*-statistic	*p*-value	2017-2018 (Percentage Point Δ)	*t*-statistic	*p*-value	2016-2018 (Percentage Point Δ)	*t*-statistic	*p*-value
Trifolium repens	0.0	-0.57	0.58	0.0	-1.00	0.33	0.1	-1.00	0.33
Trifolium sp.	-0.1	1.46	0.16	0.0	--	--	-0.1	1.46	0.16
Trifolium subterraneum	0.0	--	--	0.9	-1.93	0.07	0.9	-1.93	0.07
Triteleia hyacinthina	0.0	1.00	0.33	0.0	--	--	0.0	1.00	0.33
Verbascum blattaria	0.0	--	--	0.1	-1.00	0.33	0.1	-1.00	0.33
Veronica arvensis	0.0	-0.37	0.72	0.0	0.37	0.72	0.0	0.00	1.00
Veronica peregrina var. xalapensis	0.1	-1.42	0.17	0.0	0.37	0.72	0.1	-1.46	0.16
Veronica scutellata	0.2	-1.69	0.11	0.0	--	--	0.2	-1.69	0.11
Veronica serpyllifolia var. serpyllifolia	0.1	-2.54	**0.02***	0.1	-1.14	0.27	0.2	-3.62	**<0.01***
Vicia hirsuta	0.0	0.00	1.00	0.5	-1.33	0.20	0.5	-1.40	0.18
Vicia sativa	-0.1	1.84	0.08	0.1	-1.56	0.14	0.1	-1.00	0.33
Vicia tetrasperma	0.0	-0.57	0.58	0.4	-2.22	**0.04***	0.4	-2.40	**0.03***
Vulpia bromoides	0.0	--	--	0.0	-1.00	0.33	0.0	-1.00	0.33

Table D-6. Change in species frequency (percentage points), chi square statistic, and *p*-values for each species across sub-AA 1 at Lacamas Prairie NAP from 2016-2018. Only species used in FQA analysis are presented here. "--" = species not present in sub-AA; "n/a" = too many zeroes in matrix for McNemar's Test; *p*-values in **bold*** are considered significant ($p \leq 0.05$).

Frequency		Sub-AA 1 (Burned Fall 2015)								
Species	Quadrat Size (m^2)	2016-2017 (Percentage Point Δ)	Chi square statistic	*p*-value	2017-2018 (Percentage Point Δ)	Chi square statistic	p-value	2016-2018 (Percentage Point Δ)	Chi square statistic	p-value
Achillea millefolium	100.0	50	0.50	0.48	-50	0.50	0.48	0	n/a	n/a
Agrostis exarata	100.0	--	n/a	n/a	--	n/a	n/a	--	n/a	n/a
Alopecurus pratensis	0.1	0	n/a	n/a	-13	0.00	1.00	-13	0.00	1.00
Amelanchier alnifolia	100.0	--	n/a	n/a	--	n/a	n/a	--	n/a	n/a
Anthoxanthum odoratum	1.0	0	n/a	n/a	13	0.00	1.00	13	0.00	1.00
Barbarea orthoceras	100.0	--	n/a	n/a	--	n/a	n/a	--	n/a	n/a
Bromus commutatus	1.0	0	n/a	n/a	0	n/a	n/a	0	n/a	n/a
Camassia quamash	100.0	0	n/a	n/a	-50	0.50	0.48	-50	0.50	0.48
Cardamine cf. oligosperma	100.0	-100	0.00	1.00	0	n/a	n/a	-100	0.00	1.00
Carex densa	1.0	13	n/a	n/a	0	n/a	n/a	13	n/a	n/a
Carex obnupta	100.0	--	2.25	0.13	--	n/a	n/a	--	2.25	0.13
Carex pachystachya	100.0	25	0.00	1.00	25	0.00	1.00	50	0.50	0.48
Carex pellita	100.0	--	n/a	n/a	--	n/a	n/a	--	n/a	n/a
Carex tumulicola	100.0	25	0.00	1.00	-50	0.50	0.48	-25	0.00	1.00
Carex unilateralis	1.0	-25	0.50	0.48	25	0.25	0.62	0	0.00	1.00
Centaurium erythraea	100.0	-50	0.50	0.48	-25	0.00	1.00	-75	1.33	0.25
Cerastium fontanum ssp. vulgare	100.0	50	0.50	0.48	50	0.50	0.48	100	2.25	0.13
Cirsium arvense	100.0	-75	0.00	1.00	0	0.00	1.00	-75	0.00	1.00
Cirsium sp.	100.0	0	1.33	0.25	-25	n/a	n/a	-25	1.33	0.25
Cirsium vulgare	100.0	-50	0.50	0.48	25	0.00	1.00	-25	0.00	1.00
Convolvulus arvensis	100.0	0	n/a	n/a	0	n/a	n/a	0	n/a	n/a
Crataegus douglasii	100.0	0	n/a	n/a	25	0.00	1.00	25	0.00	1.00
Crataegus monogyna var. monogyna	100.0	--	n/a	n/a	--	n/a	n/a	--	n/a	n/a

Frequency		Sub-AA 1 (Burned Fall 2015)								
Species	Quadrat Size (m^2)	2016-2017 (Percentage Point Δ)	Chi square statistic	*p*-value	2017-2018 (Percentage Point Δ)	Chi square statistic	p-value	2016-2018 (Percentage Point Δ)	Chi square statistic	p-value
Cynosurus cristatus	100.0	--	n/a	n/a	--	n/a	n/a	--	n/a	n/a
Danthonia californica	100.0	0	n/a	n/a	-25	0.00	1.00	-25	0.00	1.00
Daucus carota	100.0	25	0.00	1.00	-25	0.00	1.00	0	n/a	n/a
Deschampsia cespitosa	10.0	13	0.00	1.00	25	0.50	0.48	38	1.33	0.25
Dianthus armeria	100.0	25	0.00	1.00	25	0.00	1.00	50	0.50	0.48
Dipsacus fullonum	100.0	0	n/a	n/a	0	n/a	n/a	0	n/a	n/a
Dodecatheon sp.	100.0	--	0.00	1.00	--	n/a	n/a	--	0.00	1.00
Eleocharis acicularis	100.0	0	n/a	n/a	100	2.25	0.13	100	2.25	0.13
Eleocharis palustris	100.0	-25	0.00	1.00	25	0.00	1.00	0	n/a	n/a
Epilobium brachycarpum	100.0	25	0.00	1.00	0	0.00	1.00	25	0.00	1.00
Epilobium ciliatum	1.0	-50	0.00	1.00	25	n/a	n/a	-25	0.00	1.00
Epilobium densiflorum	100.0	--	2.25	0.13	--	0.25	0.62	--	0.25	0.62
Epilobium sp.	100.0	0	n/a	n/a	-25	n/a	n/a	-25	n/a	n/a
Equisetum arvense	100.0	--	n/a	n/a	--	n/a	n/a	--	n/a	n/a
Eriophyllum lanatum	100.0	0	n/a	n/a	0	n/a	n/a	0	n/a	n/a
Eryngium petiolatum	100.0	--	n/a	n/a	--	n/a	n/a	--	n/a	n/a
Fraxinus latifolia	100.0	100	2.25	0.13	-25	0.00	1.00	75	1.33	0.25
Galium aparine	100.0	0	n/a	n/a	0	n/a	n/a	0	n/a	n/a
Galium trifidum	0.1	13	0.00	1.00	-13	0.00	1.00	0	0.00	1.00
Geranium dissectum	100.0	25	0.00	1.00	25	0.00	1.00	50	0.50	0.48
Geranium molle	100.0	--	0.00	1.00	--	n/a	n/a	--	0.00	1.00
Geum macrophyllum	100.0	25	0.00	1.00	-25	0.00	1.00	0	n/a	n/a
Gnaphalium palustre	100.0	-50	0.50	0.48	0	0.00	1.00	-50	0.50	0.48
Gratiola ebracteata	100.0	--	n/a	n/a	--	n/a	n/a	--	n/a	n/a
Holcus lanatus	1.0	13	0.00	1.00	50	2.25	0.13	63	3.20	0.07
Hordeum brachyantherum	100.0	--	n/a	n/a	--	n/a	n/a	--	n/a	n/a
Hypericum perforatum	100.0	25	0.00	1.00	-50	0.50	0.48	-25	0.00	1.00

Frequency		Sub-AA 1 (Burned Fall 2015)								
Species	Quadrat Size (m^2)	2016-2017 (Percentage Point Δ)	Chi square statistic	*p*-value	2017-2018 (Percentage Point Δ)	Chi square statistic	p-value	2016-2018 (Percentage Point Δ)	Chi square statistic	p-value
Hypochaeris radicata	100.0	0	n/a	n/a	0	n/a	n/a	0	n/a	n/a
Juncus balticus ssp. ater	100.0	0	n/a	n/a	0	n/a	n/a	0	n/a	n/a
Juncus bufonius	100.0	0	0.00	1.00	-50	0.50	0.48	-50	0.50	0.48
Juncus effusus ssp. pacificus	100.0	0	n/a	n/a	0	n/a	n/a	0	n/a	n/a
Juncus tenuis	10.0	-13	0.00	1.00	0	n/a	n/a	-13	0.00	1.00
Lactuca serriola	100.0	0	n/a	n/a	25	0.00	1.00	25	0.00	1.00
Leucanthemum vulgare	10.0	13	0.00	1.00	-13	0.00	1.00	0	0.00	1.00
Lolium persicum	100.0	--	n/a	n/a	--	n/a	n/a	--	n/a	n/a
Lomatium bradshawii	100.0	--	0.00	1.00	--	0.00	1.00	--	n/a	n/a
Lomatium sp.	100.0	25	n/a	n/a	-25	n/a	n/a	0	n/a	n/a
Lotus corniculatus	100.0	--	n/a	n/a	--	n/a	n/a	--	n/a	n/a
Lotus sp.	100.0	0	n/a	n/a	0	n/a	n/a	0	n/a	n/a
Lupinus polyphyllus	100.0	--	n/a	n/a	--	n/a	n/a	--	n/a	n/a
Luzula multiflora	100.0	--	n/a	n/a	--	n/a	n/a	--	n/a	n/a
Lythrum portula	100.0	--	n/a	n/a	--	n/a	n/a	--	n/a	n/a
Madia elegans	100.0	75	1.33	0.25	-75	1.33	0.25	0	n/a	n/a
Madia sativa	100.0	0	n/a	n/a	75	1.33	0.25	75	1.33	0.25
Micranthes oregana	100.0	--	n/a	n/a	--	n/a	n/a	--	n/a	n/a
Montia linearis	100.0	0	0.00	1.00	50	0.50	0.48	50	0.50	0.48
Myosotis discolor	100.0	0	n/a	n/a	25	0.00	1.00	25	0.00	1.00
Myosotis laxa	1.0	0	0.00	1.00	13	0.00	1.00	13	0.00	1.00
Navarretia intertexta	100.0	-25	0.00	1.00	-25	0.00	1.00	-50	0.50	0.48
Bellardia viscosa	100.0	50	0.50	0.48	0	n/a	n/a	50	0.50	0.48
Perideridia montana	100.0	25	n/a	n/a	-25	n/a	n/a	0	n/a	n/a
Persicaria hydropiperoides	100.0	0	0.00	1.00	0	0.00	1.00	0	n/a	n/a
Phalaris arundinacea	100.0	25	0.00	1.00	0	n/a	n/a	25	0.00	1.00
Plagiobothrys figuratus	100.0	25	0.00	1.00	0	n/a	n/a	25	0.00	1.00

Frequency		Sub-AA 1 (Burned Fall 2015)								
Species	Quadrat Size (m^2)	2016-2017 (Percentage Point Δ)	Chi square statistic	*p*-value	2017-2018 (Percentage Point Δ)	Chi square statistic	p-value	2016-2018 (Percentage Point Δ)	Chi square statistic	p-value
Plantago lanceolata	100.0	0	n/a	n/a	0	n/a	n/a	0	n/a	n/a
Poa compressa	100.0	-25	0.00	1.00	0	n/a	n/a	-25	0.00	1.00
Poa pratensis	10.0	75	4.17	**0.04***	0	n/a	n/a	75	4.17	**0.04***
Potentilla gracilis	100.0	-25	0.00	1.00	0	n/a	n/a	-25	0.00	1.00
Prunella vulgaris var. lanceolata	10.0	25	0.50	0.48	0	n/a	n/a	25	0.50	0.48
Quercus garryana	100.0	--	n/a	n/a	--	n/a	n/a	--	n/a	n/a
Ranunculus occidentalis var. occidentalis	100.0	0	n/a	n/a	25	0.00	1.00	25	0.00	1.00
Ranunculus orthorhynchus	100.0	25	0.00	1.00	-50	0.50	0.48	-25	0.00	1.00
Ranunculus sceleratus	100.0	0	0.00	1.00	0	n/a	n/a	0	0.00	1.00
Ranunculus uncinatus	100.0	0	n/a	n/a	0	n/a	n/a	0	n/a	n/a
Rorippa curvisiliqua	100.0	50	0.50	0.48	0	n/a	n/a	50	0.50	0.48
Rorippa palustris	100.0	--	n/a	n/a	--	n/a	n/a	--	n/a	n/a
Rosa nutkana ssp. nutkana	10.0	13	0.00	1.00	0	0.00	1.00	13	0.00	1.00
Rosa pisocarpa	100.0	--	n/a	n/a	--	n/a	n/a	--	n/a	n/a
Rubus bifrons	100.0	0	n/a	n/a	75	1.33	0.25	75	1.33	0.25
Rumex acetosella	100.0	25	0.00	1.00	-25	0.00	1.00	0	n/a	n/a
Rumex crispus	100.0	50	0.50	0.48	0	n/a	n/a	50	0.50	0.48
Sanicula crassicaulis	100.0	0	n/a	n/a	0	n/a	n/a	0	n/a	n/a
Schedonorus arundinaceus	100.0	0	n/a	n/a	0	n/a	n/a	0	n/a	n/a
Jacobaea vulgaris	100.0	-50	0.50	0.48	0	n/a	n/a	-50	0.50	0.48
Sisyrinchium idahoense	100.0	75	1.33	0.25	-25	0.00	1.00	50	0.50	0.48
Solanum dulcamara	100.0	--	n/a	n/a	--	n/a	n/a	--	n/a	n/a
Sonchus asper	100.0	25	0.00	1.00	0	n/a	n/a	25	0.00	1.00
Spiraea douglasii	100.0	25	0.00	1.00	-25	0.00	1.00	0	n/a	n/a
Symphoricarpos albus	100.0	0	0.50	0.48	0	0.50	0.48	0	2.25	0.13
Symphyotrichum sp.	100.0	50	n/a	n/a	50	n/a	n/a	100	n/a	n/a

Frequency		Sub-AA 1 (Burned Fall 2015)								
Species	Quadrat Size (m^2)	2016-2017 (Percentage Point Δ)	Chi square statistic	*p*-value	2017-2018 (Percentage Point Δ)	Chi square statistic	p-value	2016-2018 (Percentage Point Δ)	Chi square statistic	p-value
Taraxacum officinale	100.0	25	0.00	1.00	0	0.00	1.00	25	0.00	1.00
Trifolium dubium	100.0	75	0.50	0.48	0	n/a	n/a	75	0.50	0.48
Trifolium repens	100.0	25	1.33	0.25	0	n/a	n/a	25	1.33	0.25
Trifolium sp.	100.0	--	0.00	1.00	--	n/a	n/a	--	0.00	1.00
Trifolium subterraneum	100.0	0	0.00	1.00	25	n/a	n/a	25	0.00	1.00
Triteleia hyacinthina	100.0	--	n/a	n/a	--	0.00	1.00	--	0.00	1.00
Verbascum blattaria	100.0	0	0.00	1.00	0	0.00	1.00	0	0.00	1.00
Veronica arvensis	100.0	0	n/a	n/a	25	n/a	n/a	25	n/a	n/a
Veronica peregrina var. xalapensis	100.0	-25	0.00	1.00	-25	0.00	1.00	-50	0.50	0.48
Veronica scutellata	100.0	50	0.50	0.48	0	n/a	n/a	50	0.50	0.48
Veronica serpyllifolia var. serpyllifolia	100.0	25	0.00	1.00	25	0.00	1.00	50	0.50	0.48
Vicia hirsuta	100.0	0	n/a	n/a	0	n/a	n/a	0	n/a	n/a
Vicia sativa	100.0	0	n/a	n/a	0	n/a	n/a	0	n/a	n/a
Vicia tetrasperma	100.0	25	0.00	1.00	50	0.50	0.48	75	1.33	0.25
Vulpia bromoides	100.0	0	n/a	n/a	25	0.00	1.00	25	0.00	1.00

Table D-7. Change in species frequency (percentage points), chi square statistic, and *p*-values for each species across sub-AA 2 at Lacamas Prairie NAP from 2016-2018. Only species used in FQA analysis are presented here. "--" = species not present in sub-AA; "n/a" = too many zeroes in matrix for McNemar's Test; *p*-values in **bold*** are considered significant ($p \leq 0.05$).

Frequency		Sub-AA 2 (High Quality)								
Species	Quadrat Size (m^2)	2016-2017 (Percentage Points Δ)	Chi square statistic	*p*-value	2017-2018 (Percentage Point Δ)	Chi square statistic	p-value	2016-2018 (Percentage Point Δ)	Chi square statistic	p-value
Achillea millefolium	100.0	--	n/a	n/a	--	n/a	n/a	--	n/a	n/a
Agrostis exarata	100.0	10	0.00	1.00	-10	0.00	1.00	0	n/a	n/a
Alopecurus pratensis	0.1	10	0.50	0.48	0	n/a	n/a	10	0.50	0.48
Amelanchier alnifolia	100.0	20	0.50	0.48	10	0.00	1.00	30	1.33	0.25
Anthoxanthum odoratum	1.0	5	0.00	1.00	0	0.00	1.00	5	0.00	1.00
Barbarea orthoceras	100.0	--	n/a	n/a	--	n/a	n/a	--	n/a	n/a
Bromus commutatus	1.0	5	0.00	1.00	5	0.00	1.00	10	0.25	0.62
Camassia quamash	100.0	-20	0.50	0.48	10	0.00	1.00	-10	0.00	1.00
Cardamine cf. oligosperma	100.0	20	0.50	0.48	-10	1.33	0.25	10	0.00	1.00
Carex densa	1.0	10	0.00	1.00	-15	n/a	n/a	-5	0.00	1.00
Carex obnupta	100.0	-10	0.50	0.48	0	0.00	1.00	-10	0.00	1.00
Carex pachystachya	100.0	0	n/a	n/a	20	0.50	0.48	20	0.50	0.48
Carex pellita	100.0	0	n/a	n/a	0	n/a	n/a	0	n/a	n/a
Carex tumulicola	100.0	0	n/a	n/a	0	0.00	1.00	0	0.00	1.00
Carex unilateralis	1.0	0	0.00	1.00	0	0.00	1.00	0	0.00	1.00
Centaurium erythraea	100.0	10	0.00	1.00	-20	0.25	0.62	-10	0.00	1.00
Cerastium fontanum ssp. vulgare	100.0	20	0.50	0.48	-20	0.50	0.48	0	0.00	1.00
Cirsium arvense	100.0	--	0.00	1.00	--	0.00	1.00	--	n/a	n/a
Cirsium sp.	100.0	10	n/a	n/a	-10	n/a	n/a	0	n/a	n/a
Cirsium vulgare	100.0	0	n/a	n/a	10	0.00	1.00	10	0.00	1.00
Convolvulus arvensis	100.0	--	n/a	n/a	--	n/a	n/a	--	n/a	n/a
Crataegus douglasii	100.0	30	1.33	0.25	10	0.00	1.00	40	2.25	0.13

Frequency		Sub-AA 2 (High Quality)								
Species	Quadrat Size (m^2)	2016-2017 (Percentage Points Δ)	Chi square statistic	*p*-value	2017-2018 (Percentage Point Δ)	Chi square statistic	p-value	2016-2018 (Percentage Point Δ)	Chi square statistic	p-value
Crataegus monogyna var. monogyna	100.0	0	n/a	n/a	0	n/a	n/a	0	n/a	n/a
Cynosurus cristatus	100.0	10	0.00	1.00	10	0.00	1.00	20	0.50	0.48
Danthonia californica	100.0	-30	1.33	0.25	20	0.50	0.48	-10	0.00	1.00
Daucus carota	100.0	0	n/a	n/a	10	0.00	1.00	10	0.00	1.00
Deschampsia cespitosa	10.0	10	0.25	0.62	5	0.00	1.00	15	0.80	0.37
Dianthus armeria	100.0	-30	1.33	0.25	0	n/a	n/a	-30	1.33	0.25
Dipsacus fullonum	100.0	--	n/a	n/a	--	n/a	n/a	--	n/a	n/a
Dodecatheon sp.	100.0	--	n/a	n/a	--	n/a	n/a	--	n/a	n/a
Eleocharis acicularis	100.0	0	0.00	1.00	0	0.00	1.00	0	n/a	n/a
Eleocharis palustris	100.0	0	n/a	n/a	0	n/a	n/a	0	n/a	n/a
Epilobium brachycarpum	100.0	10	n/a	n/a	30	0.00	1.00	40	0.00	1.00
Epilobium ciliatum	1.0	20	0.00	1.00	-30	1.33	0.25	-10	2.25	0.13
Epilobium densiflorum	100.0	-20	1.50	0.22	0	3.13	0.08	-20	0.13	0.72
Epilobium sp.	100.0	0	0.50	0.48	-10	n/a	n/a	-10	0.50	0.48
Equisetum arvense	100.0	-10	0.00	1.00	0	n/a	n/a	-10	0.00	1.00
Eriophyllum lanatum	100.0	--	n/a	n/a	--	n/a	n/a	--	n/a	n/a
Eryngium petiolatum	100.0	-10	0.00	1.00	0	n/a	n/a	-10	0.00	1.00
Fraxinus latifolia	100.0	30	1.33	0.25	-20	0.50	0.48	10	0.00	1.00
Galium aparine	100.0	--	n/a	n/a	--	n/a	n/a	--	n/a	n/a
Galium trifidum	0.1	20	2.25	0.13	-10	0.50	0.48	10	0.25	0.62
Geranium dissectum	100.0	0	n/a	n/a	0	n/a	n/a	0	n/a	n/a
Geranium molle	100.0	--	n/a	n/a	--	n/a	n/a	--	n/a	n/a
Geum macrophyllum	100.0	10	0.00	1.00	0	n/a	n/a	10	0.00	1.00
Gnaphalium palustre	100.0	-20	0.50	0.48	0	n/a	n/a	-20	0.50	0.48
Gratiola ebracteata	100.0	10	0.00	1.00	0	n/a	n/a	10	0.00	1.00
Holcus lanatus	1.0	0	0.00	1.00	0	0.00	1.00	0	0.00	1.00

Frequency		Sub-AA 2 (High Quality)								
Species	Quadrat Size (m^2)	2016-2017 (Percentage Points Δ)	Chi square statistic	*p*-value	2017-2018 (Percentage Point Δ)	Chi square statistic	p-value	2016-2018 (Percentage Point Δ)	Chi square statistic	p-value
Hordeum brachyantherum	100.0	0	n/a	n/a	-10	0.00	1.00	-10	0.00	1.00
Hypericum perforatum	100.0	--	n/a	n/a	--	n/a	n/a	--	n/a	n/a
Hypochaeris radicata	100.0	-20	0.50	0.48	10	0.00	1.00	-10	0.00	1.00
Juncus balticus ssp. ater	100.0	--	n/a	n/a	--	n/a	n/a	--	n/a	n/a
Juncus bufonius	100.0	20	0.25	0.62	-20	0.25	0.62	0	n/a	n/a
Juncus effusus ssp. pacificus	100.0	10	0.00	1.00	-10	0.00	1.00	0	n/a	n/a
Juncus tenuis	10.0	-10	0.25	0.62	0	0.00	1.00	-10	0.25	0.62
Lactuca serriola	100.0	--	n/a	n/a	--	n/a	n/a	--	n/a	n/a
Leucanthemum vulgare	10.0	-10	0.25	0.62	5	0.00	1.00	-5	0.00	1.00
Lolium persicum	100.0	--	n/a	n/a	--	n/a	n/a	--	n/a	n/a
Lomatium bradshawii	100.0	0	n/a	n/a	-10	n/a	n/a	-10	n/a	n/a
Lomatium sp.	100.0	--	n/a	n/a	--	0.00	1.00	--	0.00	1.00
Lotus corniculatus	100.0	-10	n/a	n/a	0	n/a	n/a	-10	n/a	n/a
Lotus sp.	100.0	--	0.00	1.00	--	n/a	n/a	--	0.00	1.00
Lupinus polyphyllus	100.0	10	0.00	1.00	-10	0.00	1.00	0	0.00	1.00
Luzula multiflora	100.0	0	n/a	n/a	10	0.00	1.00	10	0.00	1.00
Lythrum portula	100.0	--	n/a	n/a	--	n/a	n/a	--	n/a	n/a
Madia elegans	100.0	0	n/a	n/a	20	0.50	0.48	20	0.50	0.48
Madia sativa	100.0	-20	0.50	0.48	50	3.20	0.07	30	1.33	0.25
Micranthes oregana	100.0	--	n/a	n/a	--	n/a	n/a	--	n/a	n/a
Montia linearis	100.0	20	0.25	0.62	0	0.00	1.00	20	0.25	0.62
Myosotis discolor	100.0	10	0.00	1.00	10	0.00	1.00	20	0.50	0.48
Myosotis laxa	1.0	15	0.80	0.37	-15	1.33	0.25	0	0.00	1.00
Navarretia intertexta	100.0	-10	0.00	1.00	0	0.00	1.00	-10	0.00	1.00
Bellardia viscosa	100.0	50	3.20	0.07	-20	0.50	0.48	30	0.80	0.37
Perideridia montana	100.0	40	1.33	0.25	0	n/a	n/a	40	1.33	0.25

Frequency		Sub-AA 2 (High Quality)								
Species	Quadrat Size (m^2)	2016-2017 (Percentage Points Δ)	Chi square statistic	*p*-value	2017-2018 (Percentage Point Δ)	Chi square statistic	p-value	2016-2018 (Percentage Point Δ)	Chi square statistic	p-value
Persicaria hydropiperoides	100.0	-30	2.25	0.13	0	0.00	1.00	-30	2.25	0.13
Phalaris arundinacea	100.0	30	1.33	0.25	-20	0.50	0.48	10	0.00	1.00
Plagiobothrys figuratus	100.0	0	0.00	1.00	0	n/a	n/a	0	0.00	1.00
Plantago lanceolata	100.0	-20	0.50	0.48	0	0.00	1.00	-20	0.50	0.48
Poa compressa	100.0	10	0.00	1.00	0	n/a	n/a	10	0.00	1.00
Poa pratensis	10.0	5	0.00	1.00	-15	0.80	0.37	-10	0.17	0.68
Potentilla gracilis	100.0	20	0.50	0.48	-10	0.00	1.00	10	0.00	1.00
Prunella vulgaris var. lanceolata	10.0	-5	0.00	1.00	5	0.00	1.00	0	0.00	1.00
Quercus garryana	100.0	--	n/a	n/a	--	n/a	n/a	--	n/a	n/a
Ranunculus occidentalis var. occidentalis	100.0	-10	0.00	1.00	0	0.00	1.00	-10	0.00	1.00
Ranunculus orthorhynchus	100.0	10	0.00	1.00	0	n/a	n/a	10	0.00	1.00
Ranunculus sceleratus	100.0	--	n/a	n/a	--	n/a	n/a	--	n/a	n/a
Ranunculus uncinatus	100.0	--	n/a	n/a	--	n/a	n/a	--	n/a	n/a
Rorippa curvisiliqua	100.0	-40	2.25	0.13	30	0.80	0.37	-10	0.00	1.00
Rorippa palustris	100.0	-10	0.00	1.00	0	n/a	n/a	-10	0.00	1.00
Rosa nutkana ssp. nutkana	10.0	0	0.00	1.00	10	0.50	0.48	10	0.25	0.62
Rosa pisocarpa	100.0	10	0.00	1.00	-20	0.50	0.48	-10	0.00	1.00
Rubus bifrons	100.0	-10	0.00	1.00	0	n/a	n/a	-10	0.00	1.00
Rumex acetosella	100.0	-10	0.00	1.00	0	n/a	n/a	-10	0.00	1.00
Rumex crispus	100.0	-10	0.00	1.00	-20	0.50	0.48	-30	0.80	0.37
Sanicula crassicaulis	100.0	--	n/a	n/a	--	n/a	n/a	--	n/a	n/a
Schedonorus arundinaceus	100.0	0	n/a	n/a	-10	0.00	1.00	-10	0.00	1.00
Jacobaea vulgaris	100.0	-20	0.50	0.48	-20	0.25	0.62	-40	2.25	0.13
Sisyrinchium idahoense	100.0	-20	0.50	0.48	-30	1.33	0.25	-50	3.20	0.07
Solanum dulcamara	100.0	0	n/a	n/a	-10	0.00	1.00	-10	0.00	1.00

Frequency		Sub-AA 2 (High Quality)								
Species	Quadrat Size (m^2)	2016-2017 (Percentage Points Δ)	Chi square statistic	*p*-value	2017-2018 (Percentage Point Δ)	Chi square statistic	p-value	2016-2018 (Percentage Point Δ)	Chi square statistic	p-value
Sonchus asper	100.0	-10	0.00	1.00	0	n/a	n/a	-10	0.00	1.00
Spiraea douglasii	100.0	--	n/a	n/a	--	n/a	n/a	--	n/a	n/a
Symphoricarpos albus	100.0	0	n/a	n/a	0	n/a	n/a	0	n/a	n/a
Symphyotrichum sp.	100.0	0	0.00	1.00	0	n/a	n/a	0	0.00	1.00
Taraxacum officinale	100.0	0	n/a	n/a	0	n/a	n/a	0	n/a	n/a
Trifolium dubium	100.0	20	n/a	n/a	-20	n/a	n/a	0	n/a	n/a
Trifolium repens	100.0	--	0.50	0.48	--	0.50	0.48	--	n/a	n/a
Trifolium sp.	100.0	--	n/a	n/a	--	n/a	n/a	--	n/a	n/a
Trifolium subterraneum	100.0	--	n/a	n/a	--	n/a	n/a	--	n/a	n/a
Triteleia hyacinthina	100.0	--	n/a	n/a	--	n/a	n/a	--	n/a	n/a
Verbascum blattaria	100.0	--	0.00	1.00	--	0.50	0.48	--	0.25	0.62
Veronica arvensis	100.0	0	n/a	n/a	-20	n/a	n/a	-20	n/a	n/a
Veronica peregrina var. xalapensis	100.0	0	n/a	n/a	10	0.00	1.00	10	0.00	1.00
Veronica scutellata	100.0	10	0.00	1.00	0	n/a	n/a	10	0.00	1.00
Veronica serpyllifolia var. serpyllifolia	100.0	20	0.50	0.48	30	0.80	0.37	50	3.20	0.07
Vicia hirsuta	100.0	20	0.50	0.48	0	0.00	1.00	20	0.50	0.48
Vicia sativa	100.0	-10	0.00	1.00	10	0.00	1.00	0	n/a	n/a
Vicia tetrasperma	100.0	0	0.00	1.00	20	0.50	0.48	20	0.50	0.48
Vulpia bromoides	100.0	--	n/a	n/a	--	n/a	n/a	--	n/a	n/a

Table D-8. Change in species frequency (percentage points), chi square statistic, and *p*-values for each species across sub-AA 3 at Lacamas Prairie NAP from 2016-2018. Only species used in FQA analysis are presented here. "--" = species not present in sub-AA; "n/a" = too many zeroes in matrix for McNemar's Test; *p*-values in **bold*** are considered significant ($p \leq 0.05$).

Frequency		Sub-AA 3 (Burned Fall 2016)								
Species	Quadrat Size (m^2)	2016-2017 (Percentage Point Δ)	Chi square statistic	*p*-value	2017-2018 (Percentage Point Δ)	Chi square statistic	*p*-value	2016-2018 (Percentage Point Δ)	Chi square statistic	*p*-value
Achillea millefolium	100.0	100	3.20	0.07	0	n/a	n/a	100	3.20	0.07
Agrostis exarata	100.0	--	n/a	n/a	--	n/a	n/a	--	n/a	n/a
Alopecurus pratensis	0.1	10	0.00	1.00	-10	0.00	1.00	0	0.00	1.00
Amelanchier alnifolia	100.0	--	n/a	n/a	--	n/a	n/a	--	n/a	n/a
Anthoxanthum odoratum	1.0	-60	4.17	**0.04***	60	4.17	**0.04***	0	0.00	1.00
Barbarea orthoceras	100.0	60	1.33	0.25	40	0.50	0.48	100	3.20	0.07
Bromus commutatus	1.0	-80	6.13	**0.01***	20	0.50	0.48	-60	4.17	**0.04***
Camassia quamash	100.0	0	n/a	n/a	0	n/a	n/a	0	n/a	n/a
Cardamine cf. oligosperma	100.0	-20	0.00	1.00	0	n/a	n/a	-20	0.00	1.00
Carex densa	1.0	10	n/a	n/a	0	n/a	n/a	10	n/a	n/a
Carex obnupta	100.0	--	0.00	1.00	--	n/a	n/a	--	0.00	1.00
Carex pachystachya	100.0	0	n/a	n/a	0	n/a	n/a	0	n/a	n/a
Carex pellita	100.0	--	n/a	n/a	--	n/a	n/a	--	n/a	n/a
Carex tumulicola	100.0	0	n/a	n/a	0	n/a	n/a	0	n/a	n/a
Carex unilateralis	1.0	40	2.25	0.13	-40	2.25	0.13	0	0.00	1.00
Centaurium erythraea	100.0	0	n/a	n/a	20	0.00	1.00	20	0.00	1.00
Cerastium fontanum ssp. vulgare	100.0	20	0.00	1.00	40	0.50	0.48	60	1.33	0.25
Cirsium arvense	100.0	20	n/a	n/a	20	n/a	n/a	40	n/a	n/a
Cirsium sp.	100.0	--	0.00	1.00	--	0.00	1.00	--	0.50	0.48
Cirsium vulgare	100.0	20	0.00	1.00	40	0.50	0.48	60	1.33	0.25
Convolvulus arvensis	100.0	0	n/a	n/a	20	0.00	1.00	20	0.00	1.00
Crataegus douglasii	100.0	-20	0.00	1.00	20	0.00	1.00	0	0.00	1.00
Crataegus monogyna var. monogyna	100.0	0	n/a	n/a	20	0.00	1.00	20	0.00	1.00

Frequency		Sub-AA 3 (Burned Fall 2016)								
Species	Quadrat Size (m^2)	2016-2017 (Percentage Point Δ)	Chi square statistic	*p*-value	2017-2018 (Percentage Point Δ)	Chi square statistic	*p*-value	2016-2018 (Percentage Point Δ)	Chi square statistic	*p*-value
Cynosurus cristatus	100.0	--	n/a	n/a	--	n/a	n/a	--	n/a	n/a
Danthonia californica	100.0	--	n/a	n/a	--	n/a	n/a	--	n/a	n/a
Daucus carota	100.0	20	0.00	1.00	20	0.00	1.00	40	0.50	0.48
Deschampsia cespitosa	10.0	10	0.00	1.00	60	4.17	**0.04***	70	5.14	**0.02***
Dianthus armeria	100.0	0	n/a	n/a	20	0.00	1.00	20	0.00	1.00
Dipsacus fullonum	100.0	0	n/a	n/a	20	0.00	1.00	20	0.00	1.00
Dodecatheon sp.	100.0	--	n/a	n/a	--	n/a	n/a	--	n/a	n/a
Eleocharis acicularis	100.0	0	n/a	n/a	20	0.00	1.00	20	0.00	1.00
Eleocharis palustris	100.0	--	n/a	n/a	--	n/a	n/a	--	n/a	n/a
Epilobium brachycarpum	100.0	40	0.00	1.00	20	0.00	1.00	60	0.00	1.00
Epilobium ciliatum	1.0	60	0.50	0.48	-10	0.00	1.00	50	1.33	0.25
Epilobium densiflorum	100.0	20	4.17	**0.04***	-20	0.00	1.00	0	3.20	0.07
Epilobium sp.	100.0	-20	0.00	1.00	20	0.00	1.00	0	n/a	n/a
Equisetum arvense	100.0	--	n/a	n/a	--	n/a	n/a	--	n/a	n/a
Eriophyllum lanatum	100.0	60	1.33	0.25	40	0.50	0.48	100	3.20	0.07
Eryngium petiolatum	100.0	--	n/a	n/a	--	n/a	n/a	--	n/a	n/a
Fraxinus latifolia	100.0	20	0.00	1.00	0	n/a	n/a	20	0.00	1.00
Galium aparine	100.0	0	0.00	1.00	-20	0.00	1.00	-20	0.00	1.00
Galium trifidum	0.1	20	0.25	0.62	30	1.33	0.25	50	3.20	0.07
Geranium dissectum	100.0	-40	0.50	0.48	40	0.50	0.48	0	n/a	n/a
Geranium molle	100.0	40	0.50	0.48	-20	0.00	1.00	20	0.00	1.00
Geum macrophyllum	100.0	0	n/a	n/a	0	n/a	n/a	0	n/a	n/a
Gnaphalium palustre	100.0	80	2.25	0.13	0	n/a	n/a	80	2.25	0.13
Gratiola ebracteata	100.0	40	0.50	0.48	20	0.00	1.00	60	1.33	0.25
Holcus lanatus	1.0	0	0.00	1.00	20	0.50	0.48	20	0.25	0.62
Hordeum brachyantherum	100.0	--	n/a	n/a	--	n/a	n/a	--	n/a	n/a
Hypericum perforatum	100.0	20	0.00	1.00	-60	1.33	0.25	-40	0.50	0.48

Frequency		Sub-AA 3 (Burned Fall 2016)								
Species	Quadrat Size (m^2)	2016-2017 (Percentage Point Δ)	Chi square statistic	*p*-value	2017-2018 (Percentage Point Δ)	Chi square statistic	*p*-value	2016-2018 (Percentage Point Δ)	Chi square statistic	*p*-value
Hypochaeris radicata	100.0	-20	0.00	1.00	60	1.33	0.25	40	0.50	0.48
Juncus balticus ssp. ater	100.0	0	n/a	n/a	-40	0.50	0.48	-40	0.50	0.48
Juncus bufonius	100.0	80	2.25	0.13	-20	0.00	1.00	60	1.33	0.25
Juncus effusus ssp. pacificus	100.0	-20	0.00	1.00	0	n/a	n/a	-20	0.00	1.00
Juncus tenuis	10.0	30	0.80	0.37	-10	0.00	1.00	20	0.17	0.68
Lactuca serriola	100.0	20	0.00	1.00	60	1.33	0.25	80	2.25	0.13
Leucanthemum vulgare	10.0	10	0.00	1.00	0	n/a	n/a	10	0.00	1.00
Lolium persicum	100.0	0	n/a	n/a	20	0.00	1.00	20	0.00	1.00
Lomatium bradshawii	100.0	20	n/a	n/a	0	n/a	n/a	20	n/a	n/a
Lomatium sp.	100.0	--	0.00	1.00	--	0.00	1.00	--	0.00	1.00
Lotus corniculatus	100.0	20	0.00	1.00	-20	n/a	n/a	0	0.00	1.00
Lotus sp.	100.0	-20	0.00	1.00	0	0.00	1.00	-20	n/a	n/a
Lupinus polyphyllus	100.0	80	2.25	0.13	-60	1.33	0.25	20	0.00	1.00
Luzula multiflora	100.0	--	n/a	n/a	--	n/a	n/a	--	n/a	n/a
Lythrum portula	100.0	20	0.00	1.00	-20	0.00	1.00	0	n/a	n/a
Madia elegans	100.0	40	0.50	0.48	0	n/a	n/a	40	0.50	0.48
Madia sativa	100.0	0	n/a	n/a	60	1.33	0.25	60	1.33	0.25
Micranthes oregana	100.0	20	0.00	1.00	0	n/a	n/a	20	0.00	1.00
Montia linearis	100.0	20	0.00	1.00	40	0.50	0.48	60	1.33	0.25
Myosotis discolor	100.0	40	0.50	0.48	0	0.00	1.00	40	0.25	0.62
Myosotis laxa	1.0	60	4.17	**0.04***	0	0.00	1.00	60	4.17	**0.04***
Navarretia intertexta	100.0	20	0.00	1.00	40	0.50	0.48	60	1.33	0.25
Bellardia viscosa	100.0	60	1.33	0.25	20	0.00	1.00	80	2.25	0.13
Perideridia montana	100.0	20	n/a	n/a	-40	n/a	n/a	-20	n/a	n/a
Persicaria hydropiperoides	100.0	--	0.00	1.00	--	0.50	0.48	--	0.00	1.00
Phalaris arundinacea	100.0	--	n/a	n/a	--	n/a	n/a	--	n/a	n/a
Plagiobothrys figuratus	100.0	60	1.33	0.25	-20	0.00	1.00	40	0.50	0.48

Frequency		Sub-AA 3 (Burned Fall 2016)								
Species	Quadrat Size (m^2)	2016-2017 (Percentage Point Δ)	Chi square statistic	*p*-value	2017-2018 (Percentage Point Δ)	Chi square statistic	*p*-value	2016-2018 (Percentage Point Δ)	Chi square statistic	*p*-value
Plantago lanceolata	100.0	-20	0.00	1.00	40	0.50	0.48	20	0.00	1.00
Poa compressa	100.0	20	0.00	1.00	0	n/a	n/a	20	0.00	1.00
Poa pratensis	10.0	-30	0.80	0.37	-10	0.00	1.00	-40	1.50	0.22
Potentilla gracilis	100.0	60	1.33	0.25	20	0.00	1.00	80	2.25	0.13
Prunella vulgaris var. lanceolata	10.0	20	0.50	0.48	10	0.00	1.00	30	0.80	0.37
Quercus garryana	100.0	20	0.00	1.00	-20	0.00	1.00	0	n/a	n/a
Ranunculus occidentalis var. occidentalis	100.0	60	1.33	0.25	0	n/a	n/a	60	1.33	0.25
Ranunculus orthorhynchus	100.0	40	0.50	0.48	-20	0.00	1.00	20	0.00	1.00
Ranunculus sceleratus	100.0	100	3.20	0.07	-60	1.33	0.25	40	0.50	0.48
Ranunculus uncinatus	100.0	0	0.00	1.00	-20	0.00	1.00	-20	0.00	1.00
Rorippa curvisiliqua	100.0	20	0.00	1.00	0	n/a	n/a	20	0.00	1.00
Rorippa palustris	100.0	--	n/a	n/a	--	n/a	n/a	--	n/a	n/a
Rosa nutkana ssp. nutkana	10.0	0	0.00	1.00	0	n/a	n/a	0	0.00	1.00
Rosa pisocarpa	100.0	--	n/a	n/a	--	n/a	n/a	--	n/a	n/a
Rubus bifrons	100.0	20	0.00	1.00	20	0.00	1.00	40	0.50	0.48
Rumex acetosella	100.0	40	0.25	0.62	-40	0.25	0.62	0	n/a	n/a
Rumex crispus	100.0	-40	0.50	0.48	40	0.50	0.48	0	0.00	1.00
Sanicula crassicaulis	100.0	0	n/a	n/a	0	n/a	n/a	0	n/a	n/a
Schedonorus arundinaceus	100.0	-20	0.00	1.00	-20	0.00	1.00	-40	0.50	0.48
Jacobaea vulgaris	100.0	-40	0.50	0.48	20	0.00	1.00	-20	0.00	1.00
Sisyrinchium idahoense	100.0	60	1.33	0.25	0	n/a	n/a	60	1.33	0.25
Solanum dulcamara	100.0	--	n/a	n/a	--	n/a	n/a	--	n/a	n/a
Sonchus asper	100.0	40	0.50	0.48	40	0.50	0.48	80	2.25	0.13
Spiraea douglasii	100.0	0	n/a	n/a	20	0.00	1.00	20	0.00	1.00
Symphoricarpos albus	100.0	0	0.00	1.00	0	0.50	0.48	0	1.33	0.25
Symphyotrichum sp.	100.0	20	n/a	n/a	40	n/a	n/a	60	n/a	n/a

Frequency		Sub-AA 3 (Burned Fall 2016)								
Species	Quadrat Size (m^2)	2016-2017 (Percentage Point Δ)	Chi square statistic	*p*-value	2017-2018 (Percentage Point Δ)	Chi square statistic	*p*-value	2016-2018 (Percentage Point Δ)	Chi square statistic	*p*-value
Taraxacum officinale	100.0	20	0.00	1.00	40	0.50	0.48	60	1.33	0.25
Trifolium dubium	100.0	40	n/a	n/a	60	n/a	n/a	100	n/a	n/a
Trifolium repens	100.0	0	0.50	0.48	20	1.33	0.25	20	3.20	0.07
Trifolium sp.	100.0	--	n/a	n/a	--	n/a	n/a	--	n/a	n/a
Trifolium subterraneum	100.0	0	0.00	1.00	80	0.00	1.00	80	0.00	1.00
Triteleia hyacinthina	100.0	--	n/a	n/a	--	2.25	0.13	--	2.25	0.13
Verbascum blattaria	100.0	--	0.00	1.00	--	0.00	1.00	--	0.00	1.00
Veronica arvensis	100.0	20	n/a	n/a	0	n/a	n/a	20	n/a	n/a
Veronica peregrina var. xalapensis	100.0	80	2.25	0.13	20	0.00	1.00	100	3.20	0.07
Veronica scutellata	100.0	--	n/a	n/a	--	n/a	n/a	--	n/a	n/a
Veronica serpyllifolia var. serpyllifolia	100.0	40	0.50	0.48	-20	0.00	1.00	20	0.00	1.00
Vicia hirsuta	100.0	0	n/a	n/a	0	n/a	n/a	0	n/a	n/a
Vicia sativa	100.0	-40	0.50	0.48	40	0.50	0.48	0	n/a	n/a
Vicia tetrasperma	100.0	0	n/a	n/a	0	n/a	n/a	0	n/a	n/a
Vulpia bromoides	100.0	--	n/a	n/a	--	n/a	n/a	--	n/a	n/a

Table D-9. Change in species frequency (percentage points), chi square statistic, and *p*-values for each species across the full AA at Lacamas Prairie NAP from 2016-2018. Only species used in FQA analysis are presented here. "--" = species not present in sub-AA; "n/a" = too many zeroes in matrix for McNemar's Test; *p*-values in **bold*** are considered significant ($p \leq 0.05$).

Frequency		Full AA								
Species	Quadrat Size (m^2)	2016-2017 (Percentage Point Δ)	Chi square statistic	*p*-value	2017-2018 (Percentage Point Δ)	Chi square statistic	*p*-value	2016-2018 (Percentage Point Δ)	Chi square statistic	*p*-value
Achillea millefolium	100.0	37	5.14	**0.02***	-11	0.50	0.48	26	3.20	0.07
Agrostis exarata	100.0	5	0.00	1.00	-5	0.00	1.00	0	n/a	n/a
Alopecurus pratensis	0.1	8	1.33	0.25	-5	0.25	0.62	3	0.00	1.00
Amelanchier alnifolia	100.0	11	0.50	0.48	5	0.00	1.00	16	1.33	0.25
Anthoxanthum odoratum	1.0	-13	1.45	0.23	18	2.77	0.10	5	0.07	0.79
Barbarea orthoceras	100.0	16	1.33	0.25	11	0.50	0.48	26	3.20	0.07
Bromus commutatus	1.0	-18	3.27	0.07	8	1.33	0.25	-11	0.90	0.34
Camassia quamash	100.0	-11	0.50	0.48	-5	0.00	1.00	-16	1.33	0.25
Cardamine cf. oligosperma	100.0	-16	2.25	0.13	-5	1.33	0.25	-21	0.00	1.00
Carex densa	1.0	11	0.00	1.00	-8	n/a	n/a	3	0.00	1.00
Carex obnupta	100.0	-5	0.57	0.45	0	0.00	1.00	-5	1.50	0.22
Carex pachystachya	100.0	5	0.00	1.00	16	1.33	0.25	21	2.25	0.13
Carex pellita	100.0	0	n/a	n/a	0	n/a	n/a	0	n/a	n/a
Carex tumulicola	100.0	5	0.00	1.00	-11	0.25	0.62	-5	0.00	1.00
Carex unilateralis	1.0	5	0.13	0.72	-5	0.10	0.75	0	0.00	1.00
Centaurium erythraea	100.0	-5	0.00	1.00	-11	0.17	0.68	-16	0.57	0.45
Cerastium fontanum ssp. vulgare	100.0	26	3.20	0.07	11	0.17	0.68	37	4.00	**0.05***
Cirsium arvense	100.0	-11	0.00	1.00	5	0.50	0.48	-5	0.00	1.00
Cirsium sp.	100.0	5	0.25	0.62	-11	0.00	1.00	-5	0.00	1.00
Cirsium vulgare	100.0	-5	0.00	1.00	21	2.25	0.13	16	0.57	0.45
Convolvulus arvensis	100.0	0	n/a	n/a	5	0.00	1.00	5	0.00	1.00
Crataegus douglasii	100.0	11	0.17	0.68	16	1.33	0.25	26	2.29	0.13
Crataegus monogyna var. monogyna	100.0	0	n/a	n/a	5	0.00	1.00	5	0.00	1.00
Cynosurus cristatus	100.0	5	0.00	1.00	5	0.00	1.00	11	0.50	0.48

Frequency		Full AA								
Species	Quadrat Size (m^2)	2016-2017 (Percentage Point Δ)	Chi square statistic	*p*-value	2017-2018 (Percentage Point Δ)	Chi square statistic	*p*-value	2016-2018 (Percentage Point Δ)	Chi square statistic	*p*-value
Danthonia californica	100.0	-16	1.33	0.25	5	0.00	1.00	-11	0.50	0.48
Daucus carota	100.0	11	0.50	0.48	5	0.00	1.00	16	1.33	0.25
Deschampsia cespitosa	10.0	11	1.13	0.29	24	5.82	**0.02***	34	9.60	**<0.01***
Dianthus armeria	100.0	-11	0.25	0.62	11	0.50	0.48	0	0.00	1.00
Dipsacus fullonum	100.0	0	n/a	n/a	5	0.00	1.00	5	0.00	1.00
Dodecatheon sp.	100.0	-5	0.00	1.00	0	n/a	n/a	-5	0.00	1.00
Eleocharis acicularis	100.0	0	0.00	1.00	26	2.29	0.13	26	3.20	0.07
Eleocharis palustris	100.0	-5	0.00	1.00	5	0.00	1.00	0	n/a	n/a
Epilobium brachycarpum	100.0	21	0.00	1.00	21	0.00	1.00	42	0.25	0.62
Epilobium ciliatum	1.0	16	2.25	0.13	-13	2.25	0.13	3	6.13	**0.01***
Epilobium densiflorum	100.0	-5	1.56	0.21	-5	0.94	0.33	-11	0.00	1.00
Epilobium sp.	100.0	-5	0.00	1.00	-5	0.00	1.00	-11	0.50	0.48
Equisetum arvense	100.0	-5	0.00	1.00	0	n/a	n/a	-5	0.00	1.00
Eriophyllum lanatum	100.0	16	1.33	0.25	11	0.50	0.48	26	3.20	0.07
Eryngium petiolatum	100.0	-5	0.00	1.00	0	n/a	n/a	-5	0.00	1.00
Fraxinus latifolia	100.0	42	6.13	**0.01***	-16	1.33	0.25	26	3.20	0.07
Galium aparine	100.0	0	0.00	1.00	-5	0.00	1.00	-5	0.00	1.00
Galium trifidum	0.1	18	3.27	0.07	0	0.00	1.00	18	2.77	0.10
Geranium dissectum	100.0	-5	0.00	1.00	16	1.33	0.25	11	0.50	0.48
Geranium molle	100.0	5	0.00	1.00	-5	0.00	1.00	0	0.00	1.00
Geum macrophyllum	100.0	11	0.50	0.48	-5	0.00	1.00	5	0.00	1.00
Gnaphalium palustre	100.0	0	0.00	1.00	0	0.00	1.00	0	0.00	1.00
Gratiola ebracteata	100.0	16	1.33	0.25	5	0.00	1.00	21	2.25	0.13
Holcus lanatus	1.0	3	0.00	1.00	16	2.08	0.15	18	2.40	0.12
Hordeum brachyantherum	100.0	0	n/a	n/a	-5	0.00	1.00	-5	0.00	1.00
Hypericum perforatum	100.0	11	0.50	0.48	-26	3.20	0.07	-16	1.33	0.25
Hypochaeris radicata	100.0	-16	1.33	0.25	21	1.50	0.22	5	0.00	1.00
Juncus balticus ssp. ater	100.0	0	n/a	n/a	-11	0.50	0.48	-11	0.50	0.48

Frequency		Full AA								
Species	Quadrat Size (m^2)	2016-2017 (Percentage Point Δ)	Chi square statistic	*p*-value	2017-2018 (Percentage Point Δ)	Chi square statistic	*p*-value	2016-2018 (Percentage Point Δ)	Chi square statistic	*p*-value
Juncus bufonius	100.0	32	2.50	0.11	-26	2.29	0.13	5	0.00	1.00
Juncus effusus ssp. pacificus	100.0	0	0.00	1.00	-5	0.00	1.00	-5	0.00	1.00
Juncus tenuis	10.0	0	0.00	1.00	-3	0.00	1.00	-3	0.00	1.00
Lactuca serriola	100.0	5	0.00	1.00	21	2.25	0.13	26	3.20	0.07
Leucanthemum vulgare	10.0	0	0.00	1.00	0	0.00	1.00	0	0.00	1.00
Lolium persicum	100.0	0	n/a	n/a	5	0.00	1.00	5	0.00	1.00
Lomatium bradshawii	100.0	5	0.00	1.00	-5	0.00	1.00	0	n/a	n/a
Lomatium sp.	100.0	5	0.00	1.00	-5	0.00	1.00	0	0.00	1.00
Lotus corniculatus	100.0	0	0.00	1.00	-5	n/a	n/a	-5	0.00	1.00
Lotus sp.	100.0	-5	0.00	1.00	0	0.00	1.00	-5	0.00	1.00
Lupinus polyphyllus	100.0	26	3.20	0.07	-21	2.25	0.13	5	0.00	1.00
Luzula multiflora	100.0	0	n/a	n/a	5	0.00	1.00	5	0.00	1.00
Lythrum portula	100.0	5	0.00	1.00	-5	0.00	1.00	0	n/a	n/a
Madia elegans	100.0	26	3.20	0.07	-5	0.00	1.00	21	2.25	0.13
Madia sativa	100.0	-11	0.50	0.48	58	9.09	**<0.01***	47	7.11	**0.01***
Micranthes oregana	100.0	5	0.00	1.00	0	n/a	n/a	5	0.00	1.00
Montia linearis	100.0	16	0.57	0.45	21	1.50	0.22	37	4.00	**0.05***
Myosotis discolor	100.0	16	0.80	0.37	11	0.25	0.62	26	2.29	0.13
Myosotis laxa	1.0	24	4.27	**0.04***	-5	0.13	0.72	18	2.40	0.12
Navarretia intertexta	100.0	-5	0.00	1.00	5	0.00	1.00	0	0.00	1.00
Bellardia viscosa	100.0	53	8.10	**<0.01***	-5	0.00	1.00	47	5.82	**0.02***
Perideridia montana	100.0	32	1.33	0.25	-16	n/a	n/a	16	1.33	0.25
Persicaria hydropiperoides	100.0	-16	4.17	**0.04***	0	0.57	0.45	-16	0.80	0.37
Phalaris arundinacea	100.0	21	2.25	0.13	-11	0.50	0.48	11	0.50	0.48
Plagiobothrys figuratus	100.0	21	1.50	0.22	-5	0.00	1.00	16	0.80	0.37
Plantago lanceolata	100.0	-16	1.33	0.25	11	0.25	0.62	-5	0.00	1.00
Poa compressa	100.0	5	0.00	1.00	0	n/a	n/a	5	0.00	1.00
Poa pratensis	10.0	11	0.50	0.48	-11	0.75	0.39	0	0.00	1.00

Frequency		Full AA								
Species	Quadrat Size (m^2)	2016-2017 (Percentage Point Δ)	Chi square statistic	*p*-value	2017-2018 (Percentage Point Δ)	Chi square statistic	*p*-value	2016-2018 (Percentage Point Δ)	Chi square statistic	*p*-value
Potentilla gracilis	100.0	21	1.50	0.22	0	0.00	1.00	21	1.50	0.22
Prunella vulgaris var. lanceolata	10.0	8	0.44	0.50	5	0.17	0.68	13	1.45	0.23
Quercus garryana	100.0	5	0.00	1.00	-5	0.00	1.00	0	n/a	n/a
Ranunculus occidentalis var. occidentalis	100.0	11	0.25	0.62	5	0.00	1.00	16	0.80	0.37
Ranunculus orthorhynchus	100.0	21	2.25	0.13	-16	1.33	0.25	5	0.00	1.00
Ranunculus sceleratus	100.0	26	2.29	0.13	-16	1.33	0.25	11	0.25	0.62
Ranunculus uncinatus	100.0	0	0.00	1.00	-5	0.00	1.00	-5	0.00	1.00
Rorippa curvisiliqua	100.0	-5	0.00	1.00	16	0.80	0.37	11	0.13	0.72
Rorippa palustris	100.0	-5	0.00	1.00	0	n/a	n/a	-5	0.00	1.00
Rosa nutkana ssp. nutkana	10.0	3	0.00	1.00	5	0.25	0.62	8	0.36	0.55
Rosa pisocarpa	100.0	5	0.00	1.00	-11	0.50	0.48	-5	0.00	1.00
Rubus bifrons	100.0	0	0.00	1.00	21	1.50	0.22	21	1.50	0.22
Rumex acetosella	100.0	11	0.17	0.68	-16	0.80	0.37	-5	0.00	1.00
Rumex crispus	100.0	-5	0.00	1.00	0	0.00	1.00	-5	0.00	1.00
Sanicula crassicaulis	100.0	0	n/a	n/a	0	n/a	n/a	0	n/a	n/a
Schedonorus arundinaceus	100.0	-5	0.00	1.00	-11	0.50	0.48	-16	1.33	0.25
Jacobaea vulgaris	100.0	-32	4.17	**0.04***	-5	0.00	1.00	-37	5.14	**0.02***
Sisyrinchium idahoense	100.0	21	1.13	0.29	-21	2.25	0.13	0	0.00	1.00
Solanum dulcamara	100.0	0	n/a	n/a	-5	0.00	1.00	-5	0.00	1.00
Sonchus asper	100.0	11	0.25	0.62	11	0.50	0.48	21	1.50	0.22
Spiraea douglasii	100.0	5	0.00	1.00	0	0.00	1.00	5	0.00	1.00
Symphoricarpos albus	100.0	0	1.33	0.25	0	2.25	0.13	0	5.14	**0.02***
Symphyotrichum sp.	100.0	16	0.00	1.00	21	n/a	n/a	37	0.00	1.00
Taraxacum officinale	100.0	11	0.50	0.48	11	0.25	0.62	21	2.25	0.13
Trifolium dubium	100.0	37	0.50	0.48	5	n/a	n/a	42	0.50	0.48
Trifolium repens	100.0	5	5.14	**0.02***	5	0.00	1.00	11	6.13	**0.01***
Trifolium sp.	100.0	-11	0.00	1.00	0	n/a	n/a	-11	0.00	1.00

Frequency		Full AA								
Species	Quadrat Size (m^2)	2016-2017 (Percentage Point Δ)	Chi square statistic	*p*-value	2017-2018 (Percentage Point Δ)	Chi square statistic	*p*-value	2016-2018 (Percentage Point Δ)	Chi square statistic	*p*-value
Trifolium subterraneum	100.0	0	0.00	1.00	26	0.00	1.00	26	0.25	0.62
Triteleia hyacinthina	100.0	-5	n/a	n/a	0	3.20	0.07	-5	3.20	0.07
Verbascum blattaria	100.0	0	0.00	1.00	0	0.00	1.00	0	0.00	1.00
Veronica arvensis	100.0	5	n/a	n/a	-5	n/a	n/a	0	n/a	n/a
Veronica peregrina var. xalapensis	100.0	16	0.80	0.37	5	0.00	1.00	21	1.13	0.29
Veronica scutellata	100.0	16	1.33	0.25	0	n/a	n/a	16	1.33	0.25
Veronica serpyllifolia var. serpyllifolia	100.0	26	3.20	0.07	16	0.57	0.45	42	6.13	**0.01***
Vicia hirsuta	100.0	11	0.50	0.48	0	0.00	1.00	11	0.50	0.48
Vicia sativa	100.0	-16	1.33	0.25	16	1.33	0.25	0	n/a	n/a
Vicia tetrasperma	100.0	5	0.00	1.00	21	2.25	0.13	26	3.20	0.07
Vulpia bromoides	100.0	0	n/a	n/a	5	0.00	1.00	5	0.00	1.00

Appendix E - Floristic Quality Assessment Indices for Lacamas Prairie NAP

Table E-1. Floristic Quality Assessment Indices for each sub-AA and year at Lacamas Prairie NAP.

	Sub-AA 1 (Burned Fall 2015)				Sub-AA 2 (High Quality)				Sub-AA 3 (Burned Fall 2016)				Full AA			
Year	All	2016	2017	**2018**	All	2016	2017	**2018**	All	2016	2017	**2018**	All	2016	2017	**2018**
Mean C (Native)	3.50	3.66	3.46	**3.60**	3.39	3.40	3.49	**3.40**	3.33	3.13	3.41	**3.34**	3.44	3.47	3.42	**3.37**
Mean C (All)	1.94	2.25	1.99	**1.94**	2.03	2.04	2.03	**2.00**	1.81	1.71	1.99	**1.85**	1.98	2.05	2.00	**1.90**
Mean C (Native Trees)	2.50	--	2.00	**2.50**	3.00	2.50	3.00	**3.00**	3.00	2.50	3.00	**2.50**	3.25	2.50	3.25	**3.00**
Mean C (Native Shrubs)	3.50	4.00	3.50	**4.00**	3.67	3.67	3.67	**3.50**	3.33	3.50	3.50	**3.33**	3.50	3.67	3.50	**3.33**
Mean C (Native Herbs)	3.55	3.65	3.50	**3.66**	3.40	3.43	3.51	**3.42**	3.36	3.15	3.44	**3.38**	3.45	3.49	3.43	**3.39**
FQAI (Native)	23.74	20.68	22.16	**21.30**	24.90	22.81	22.87	**22.26**	23.80	17.16	23.15	**22.90**	28.38	26.39	26.92	**25.43**
FQAI (All)	17.67	16.22	16.85	**15.63**	19.29	17.67	17.44	**17.09**	17.53	12.67	17.66	**17.03**	21.63	20.30	20.59	**19.20**
Adjusted FQAI	26.06	28.68	26.12	**26.42**	26.25	26.34	26.59	**26.06**	24.55	23.14	26.04	**24.84**	26.01	26.66	26.15	**25.18**
% Intolerant (C Value ≥ 7)	0%	0%	0%	**0%**	0%	0%	0%	**0%**	0%	0%	0%	**0%**	0%	0%	0%	**0%**
% Tolerant (C Value ≤ 3)	71%	63%	67%	**71%**	71%	71%	70%	**73%**	76%	80%	72%	**76%**	70%	69%	70%	**73%**
Species Richness (All)	83	52	72	**65**	90	75	74	**73**	94	55	79	**85**	119	98	106	**102**
Species Richness (Native)	46	32	41	**35**	54	45	43	**43**	51	30	46	**47**	68	58	62	**57**
% Nonnative	45%	38%	43%	**46%**	40%	40%	42%	**41%**	46%	45%	42%	**45%**	43%	41%	42%	**44%**
Wet Indicator (All)	-0.27	-0.80	-0.41	**-0.57**	-0.53	-0.58	-0.58	**-0.42**	-0.18	-0.02	-0.30	**-0.17**	-0.47	-0.62	-0.46	**-0.35**
Wet Indicator (Native)	-1.92	-2.14	-1.91	**-2.61**	-2.02	-2.17	-1.95	**-1.82**	-1.61	-1.38	-1.50	**-1.78**	-1.81	-2.06	-1.74	**-1.86**
% Hydrophyte	29%	35%	31%	**32%**	34%	35%	34%	**32%**	29%	25%	30%	**29%**	31%	32%	32%	**30%**
% Native Perennial	37%	40%	40%	**34%**	42%	44%	45%	**41%**	33%	42%	37%	**35%**	39%	42%	41%	**38%**
% Native Annual	11%	12%	11%	**12%**	12%	9%	8%	**12%**	13%	5%	14%	**13%**	10%	9%	10%	**11%**
% Annual	20%	17%	19%	**25%**	21%	19%	16%	**21%**	24%	15%	24%	**25%**	20%	16%	18%	**22%**
% Perennial	60%	63%	63%	**55%**	64%	65%	69%	**63%**	55%	69%	58%	**55%**	62%	65%	63%	**59%**
# Species With Moderate Fidelity To Prairies	15	8	13	**14**	21	16	17	**18**	16	6	14	**16**	23	18	22	**21**
# Species With High Fidelity To Prairies	14	11	12	**9**	13	10	11	**11**	14	7	14	**12**	17	14	15	**13**
% Native Forbs	34%	37%	33%	**31%**	33%	32%	27%	**30%**	33%	27%	35%	**33%**	33%	33%	31%	**30%**
% Native Graminoids	13%	17%	15%	**14%**	18%	19%	20%	**19%**	11%	16%	11%	**12%**	14%	17%	16%	**16%**

Table E-2. Cover-Weighted Floristic Quality Assessment Indices for each sub-AA and year at Lacamas Prairie NAP.

	Sub-AA 1 (Burned Fall 2015)			Sub-AA 2 (High Quality)			Sub-AA 3 (Burned Fall 2016)			Full AA		
Year	2016	2017	**2018**	2016	2017	**2018**	2016	2017	**2018**	2016	2017	**2018**
Cover-weighted Mean C	2.47	1.61	1.45	2.97	3.09	3.16	0.60	2.46	1.45	2.13	2.66	2.39
Cover-weighted Mean C (Native)	3.50	3.36	3.75	4.11	4.05	4.12	3.73	4.48	3.76	3.99	4.02	4.01
Cover-weighted FQAI	17.82	13.26	11.66	25.69	26.60	27.02	4.47	21.82	13.34	21.04	27.38	23.98
Cover-weighted Native FQAI (Native)	19.81	20.98	22.18	27.58	26.59	27.00	20.44	30.37	25.76	30.42	31.66	30.29
Cover-weighted Adjusted FQAI	27.47	25.44	27.51	31.85	30.91	31.61	27.56	34.17	27.94	30.73	30.75	30.14