

# Hydrogeomorphic Functional Assessment of ARCO Wetland and Riparian Mitigation Lands

Final Status Report – 2018 Assessments



## Prepared For

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## Executive Summary

This report provides findings of final Hydrogeomorphic (HGM) Assessments that were completed during 2018 at selected ARCO mitigation parcels in the Jocko River watershed and Mission Creek. The assessments were used to determine the Confederated Salish and Kootenai Tribes' (CSKT) progress toward achieving wetland/riparian credits required under a consent decree and settlement for a natural resource damages claim. The CSKT were required to create 'up to 800 acres of newly constructed, restored, or enhanced wetlands or riparian areas' (CSKT 2003). Each acre restored to an agreed upon, cumulative HGM score of 5.39 results in 1 ARCO mitigation credit. The results of the 2018 HGM Assessments show that the CSKT restored, enhanced or preserved 826 acres of riparian and wetland habitat scoring 5.39 or higher, qualifying for mitigation credits. Based on this, CSKT produced 826 ARCO mitigation credits and has met the requirements of the settlement obligation.

### *Background*

Natural resource damages from historic mining by the Atlantic Richfield Company (ARCO) or its predecessors occurred in the Upper Clark Fork River Basin, which are aboriginal lands of the CSKT to which they still reserve rights to hunt, fish, gather, and graze stock. As part of the settlement for these damages, the Jocko River watershed within the Flathead Indian Reservation was identified as the target focus area for protection or acquisition activities to mitigation for the natural resource damages (CSKT 2000) (Figure 1). The settlement specified that the Functional Effective Wetland Area (FEWA) assessment method would be used to evaluate riparian function for determining mitigation credits. Because FEWA was designed to evaluate Upper Clark Fork River Basin conditions that included mining-related damages, the CSKT in coordination with the United States Fish Wildlife Service (USFWS), who oversees the mitigation program, selected the HGM Assessment as a replacement functional assessment method. The HGM Assessment method evaluates riparian and wetland functions within riverine habitats, specifically those in the Northern Rocky Mountain region (Hauer et al 2002). A crosswalk method to match the FEWA scores with HGM scores for crediting and was developed, and a cumulative HGM score of 5.39 was identified as the threshold score required for each acre to qualify for 1 ARCO mitigation credit.

### *HGM Assessments*

The HGM Assessment method evaluates floodplain and wetland function at two scales: landscape-scale and project-scale. At the landscape-scale, landscape assessment areas (LAAs) are defined representing reaches of the river with similar geomorphic and hydrologic characteristics. Within the LAAs 'cover types' representing distinct vegetation communities, water features, and ground covers are mapped and the LAAs are evaluated based on the distribution and connection of specific cover types, as well as geomorphic modifications and hydrologic connectivity. The project-scale is described as a wetland assessment area (WAA) in the HGM Assessment method, and is the location where field data are collected. Within each WAA, the 'cover types' are used to stratify field data collection. Field data collection focuses on vegetation community information, such as tree density, shrub cover, herbaceous plant cover, and native species composition. Soils and large wood debris frequency is also evaluated at the project-scale. HGM scores are calculated using results of assessments at both the landscape- and project-scale (Hauer et al 2002). A detailed description of the HGM Assessment Method and the methods used for this evaluation are provided in the **Methods** section of this document.

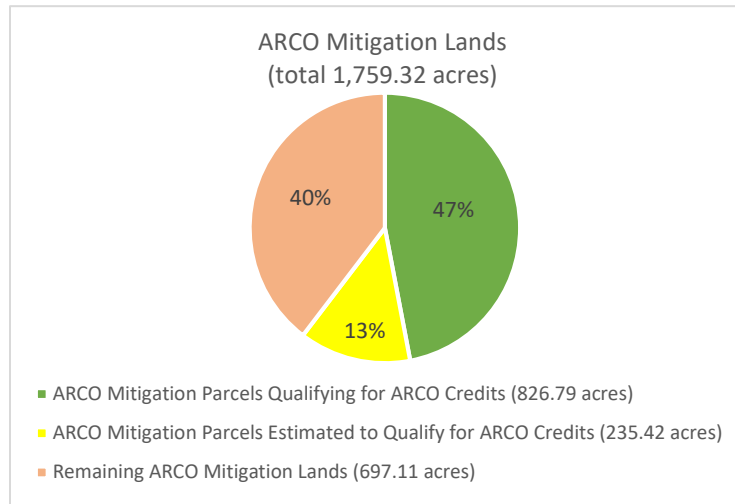
### *Findings*

Since 2003, the CSKT have worked to acquire or protect wetland and riparian lands within the Jocko River watershed, including tributary streams, on the Flathead Indian Reservation for the ARCO

Mitigation Program. As of 2018, 1,759 acres of riparian and wetland area have been protected through the ARCO Mitigation Program in the Jocko River watershed and one location in Mission Creek. Table 1 below summarizes the findings of the 2018 HGM Assessments. In Table 1, the acres reported represent only the riparian and wetland acres within the ARCO mitigation parcels that are evaluated using the HGM

Assessment Method and eligible for ARCO mitigation credits. Field data collection occurred at 10 assessment

areas within 9 ARCO mitigation parcels, indicated in Table 1 with bold text and green shading. Only sites where field data were collected to support calculating HGM Scores were considered for ARCO mitigation credits. Office-based HGM Assessments were conducted for other ARCO mitigation parcels and estimated that 3 additional assessment areas, comprising 235.42 acres, are expected to achieve an HGM score of 5.39 or higher which would qualify for ARCO mitigation credits if verified with field data (Table 1).



In addition to ARCO mitigation parcels, the CSKT has protected an additional 901 acres of wetland riparian habitat in the lower main stem Jocko River through other conservation and mitigation programs. In total, approximately 2,133 acres (47%) of the lower main stem Jocko River riparian and wetland habitat is protected and being managed for natural processes and natural resource benefits by the CSKT. Within the conservation parcels, the CSKT have removed infrastructure from the floodplain, such as houses and barns, removed livestock grazing and crop production (primarily haying), and now manage lands for natural resource benefits, allowing for floodplain processes to occur. Active restoration has occurred within some parcels, such as the Demonstration Reach mitigation site near Arlee, Montana where a deeply incised reach of the Jocko River was reconnected with its floodplain. Passive restoration has occurred at other parcels to support natural processes, such as removing interior fences between adjoining conservation parcels to allow connectivity, reinforcing exterior fences to exclude livestock grazing in the floodplain, and weed management to support recovery of native riparian vegetation communities in the floodplain.

The large area of contiguous conservation parcels within the lower mainstem Jocko River contributed to improved HGM scores in 2018, particularly the conversion of nearly 1,000 acres of pasture and agricultural crops (primarily hay fields) to native riparian and wetland vegetation communities that are managed for natural resource benefits and natural process. The change from farming or grazing land uses to management for natural processes, particularly the removal of grazing in existing riparian forest and shrub communities, contributed to improved HGM scores within all ARCO mitigation parcels.

## Hydrogeomorphic Functional Assessment of ARCO Wetland and Riparian Mitigation Lands

The CSKT is committed to long-term management and conservation of the ARCO mitigation lands and other conservation lands in the Jocko River watershed. While the obligation for ARCO mitigation credits has been achieved, the CSKT plans to continue restoration and conservation efforts at these parcels in perpetuity.

Table 1. Summary of HGM scores and at ARCO Mitigation Parcels in the Jocko River watershed.

LAA	Protected Property <sup>1</sup>	Acres <sup>2</sup>	HGM Score 2018	Estimated HGM Score 2018	ARCO Mitigation Credits as of 2018 <sup>3</sup>
<b>Main stem Jocko River Properties</b>					
<b>LAA 2</b>	Former Lease 4515 (Parcel A & Tract A)	73.37	NE	5.37	--
	Bison Range Reach	142.43	NE	<b>5.45</b>	--
	Cole (3 separate easement parcels) <sup>4</sup>	113.28	NE	NE	--
	Eggert <sup>4</sup>	0.43	NE	NE	--
	Stranahan (Parcels 1 & 3)	53.18	NE	5.32	--
<b>LAA3</b>	<b>Nicholson (Tracts 1 &amp; 4; Tracks 2 &amp; 3)</b>	<b>36.72</b>	<b>4.13</b>	--	<b>0</b>
<b>LAA 4</b>	<b>Nicholson (Tracts 1 &amp; 4; Tracks 2 &amp; 3)</b>	<b>71.63</b>	<b>5.85</b>	--	<b>71.63</b>
	<b>Squeque <sup>4</sup></b>	<b>372.24</b>	<b>6.10</b>	--	<b>372.24</b>
	<b>Schall Powell</b>	<b>50.54</b>	<b>5.62</b>	--	<b>50.55</b>
<b>LAA 5</b>	<b>Hatier (Tract 1)</b>	<b>92.17</b>	<b>5.68</b>	--	<b>92.17</b>
	<b>Former Lease 5022</b>	<b>47.35</b>	<b>5.74</b>	--	<b>47.35</b>
	Clinkenbeard (Portion of Lot A)	57.19	NE	<b>5.39</b>	--
<b>LAA 7</b>	<b>Dumontier</b>	<b>8.21</b>	<b>6.89</b>	--	<b>8.21</b>
	<b>Demonstration Reach</b>	<b>113.03</b>	<b>6.96</b>	--	<b>113.03</b>
<b>Jocko River Tributary and other Watershed Properties:</b>					
<b>North Fork Jocko River</b>	<b>North Fork Jocko River</b>				
	Former Lease 5768 (Portion of)	35.8	NE	<b>5.7</b>	--
<b>North Valley Creek</b>	<b>North Valley Creek</b>				
	<b>Nicholson (Parcel A, Sanders County)</b>	<b>23.95</b>	<b>5.02</b>	--	<b>0</b>
<b>Jocko Spring Creek</b>	<b>Jocko Spring Creek</b>				
	Jefferson	45.15	NE	5.21	--
<b>Mission Creek</b>	<b>Mission Creek</b>				
	<b>Former McCleod Allotment</b>	<b>71.61</b>	<b>6.00</b>	--	<b>71.61</b>
<b>Finley Creek</b>	<b>Finley Creek</b>				
	North Parcel, with Addition (Finley Creek Flats)	283.18	NE	4.85	0
	Former Leases 5029, 5030 (Portions of)	47.75	NE	4.79	0
	Burlington-Northern	20.11	NE	4.69	0
	<b>Total ARCO Acreage Protected</b>	<b>1,759.32</b>	<b>Total ARCO mitigation credits</b>		<b>826.79</b>

<sup>1</sup> Bold font and green background shading indicate parcels where field data were collected in 2018 to support HGM Assessments.

<sup>2</sup> Acres include only those within the Ecological Floodplain that would have the potential to qualify for mitigation credits.

<sup>3</sup> ARCO mitigation credits were only allotted to parcels where field data were collected in 2018 that also met the threshold HGM score of 5.39 to qualify for mitigation credits. A total of 800 credits or 800 acres is a requirement from the Consent Decree. Each acre acquired or restored above the threshold score (5.39) counts for one credit.

<sup>4</sup> The Cole and Eggert parcels were not evaluated using the HGM Assessment Method.



# Hydrogeomorphic Functional Assessment of ARCO Wetland and Riparian Mitigation Lands

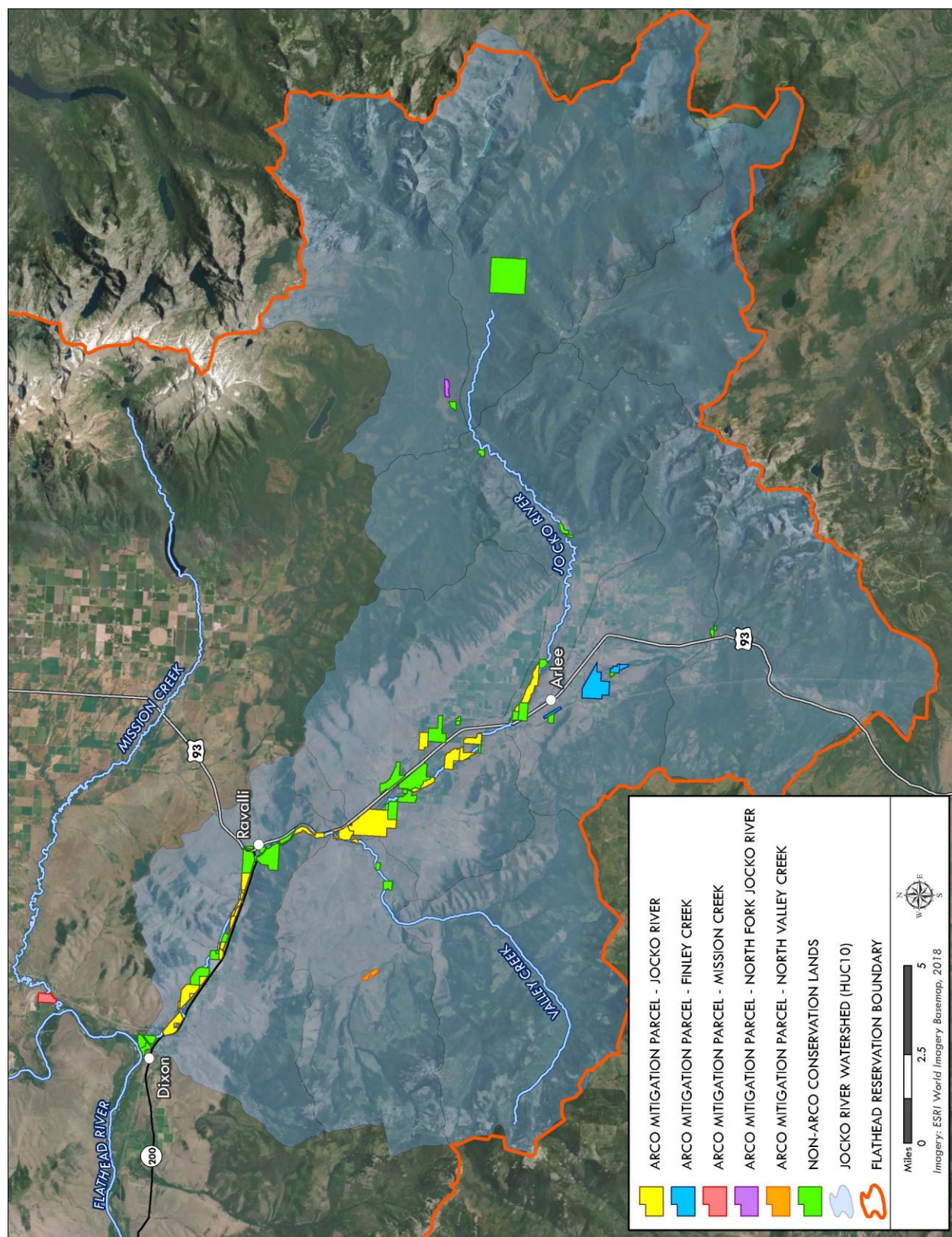


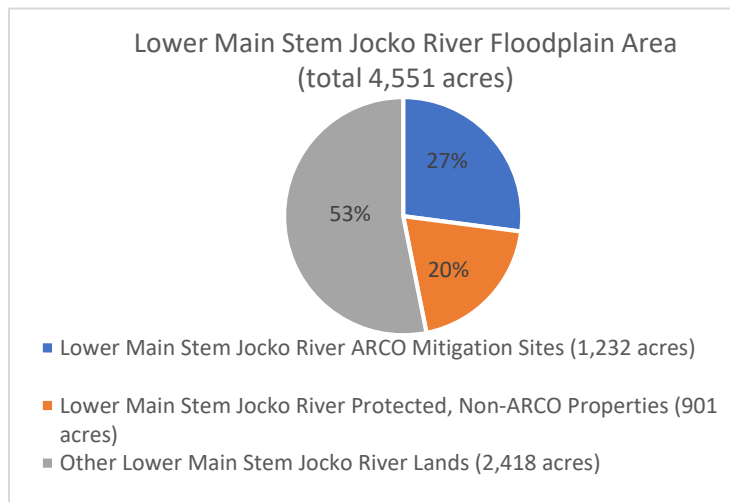
Figure 1. Vicinity map of the Jocko River watershed within the Flathead Reservation with ARCO mitigation parcels and HGM Assessment locations and other non-ARCO Conservation Lands.

## Introduction

This is the final report on the status of wetland and riparian lands within the Flathead Indian Reservation that are protected for mitigation purposes by the Confederated Salish and Kootenai Tribes (CSKT) under a Consent Decree with the Atlantic Richfield Company (ARCO). These ARCO mitigation properties are located in the Jocko River watershed and one is located in the Mission Creek watershed (Figure 1). An assessment method described in *A Regional Guidebook for Applying the Hydrogeomorphic Approach to Assessing Wetland Functions of Riverine Floodplains in the Northern Rocky Mountains* (HGM Assessment Method, Hauer and others 2002) was selected to evaluate ecological function in ARCO mitigation properties. Baseline HGM Assessments began in 2003 as ARCO mitigation parcels were first acquired. Since 2003, active stream and floodplain restoration have occurred at some of the mitigation parcels, and passive restoration and management for natural processes has occurred at other parcels.

In 2018, field data for Hydrogeomorphic (HGM) Assessments were collected to determine the degree of improvement in ecological function within ARCO mitigation parcels managed by the CSKT. Field-based HGM Assessments were conducted for nine ARCO mitigation parcels and office-based estimates of HGM scores were completed for nine other ARCO mitigation parcels (Table 2). One parcel, the Nicholson parcel, includes two tracts of land and each tract was split into a separate assessment area, resulting in 10 assessment areas that were evaluated based on field data in 2018. Two parcels were not evaluated as part of the HGM Assessments. The Eggert parcel was not assessed because its relatively small size is not reflective of floodplain function (0.4 acres). In the Cole parcel, conservation easements held by the CSKT protect the riparian corridor that is dominated by woody vegetation; however, ongoing farming practices limit wetland functions in the larger floodplain area outside of the conservation easement portion of the parcel.

Since 2003, the CSKT have acquired and protected approximately 1,759 acres of wetland and riparian habitat through the ARCO mitigation program; 1,232 acres of this protected land are along the lower main stem Jocko River from near Arlee to the confluence with the Flathead River (Figure 2). The remaining ARCO mitigation parcels include approximately 36 acres along the North Fork Jocko River, 24 acres along North Valley Creek, 45 acres along Jocko Spring Creek, 72 acres along Mission Creek, and 351 acres along Finley Creek. In addition to ARCO mitigation parcels, the CSKT have acquired or rededicated approximately 900 acres of additional wetland and riparian habitat along the Jocko River through different programs, which has amplified the beneficial effects of ARCO mitigation efforts in the lower main stem Jocko River. In total, 2,132.61 acres of the 4,550.93 acres of lower main stem Jocko River floodplain, nearly 50 percent, has been protected through ARCO mitigation parcel and other mitigation programs.



Of the 10 assessment areas that were evaluated in the field using the HGM Assessment Method in 2018, 8 achieved the threshold HGM score of 5.39 that qualifies for mitigation credit. For a parcel that achieves the threshold score, each acre counts as 1 mitigation credit. Under the Consent Decree, the CSKT were to achieve 800 credits, and based on the 2018 HGM assessment, they achieved 826 ARCO mitigation credits to date, meeting this requirement. Of the 9 assessment areas that were evaluated through an office-based HGM Assessment, 3 were estimated to have achieved the threshold score to qualify for mitigation credits, which if verified with field data, would contribute an additional 235 mitigation credits.

The following sections provide a summary of the project history, a description of the project area, methods for conducting the final HGM Assessments, and findings of the assessments.

## Hydrogeomorphic Functional Assessment of ARCO Wetland and Riparian Mitigation Lands

Table 2. Summary of the CSKT's ARCO mitigation parcels with baseline and updated HGM Assessment results.

LAA	Protected Property <sup>1</sup>		Acres 2018 <sup>2</sup>	Baseline Assessment		HGM Score 2018	Estimated Score 2018	Credits as of 2018 <sup>3</sup>
				Year	Score			
Main stem Jocko River Properties								
LAA 2	Former Lease 4515 (Parcel A & Tract A)		73.37	2003	5.03	NE	5.37	--
	Bison Range Reach	Former Lease 4513	142.43	2003	4.94	NE	5.45	--
		Radcliffe		NA	NA			--
		Cole-Chenette		NA	NA			--
	Cole (3 separate easement parcels) <sup>4</sup>		113.28	NA	NA	NE	NE	--
	Eggert <sup>4</sup>		0.43	NA	NA	NE	NE	--
	Stranahan (Parcels 1 & 3)		53.18	2003	4.65	NE	5.32	--
LAA3	Nicholson (Tracts 1 & 4; Tracks 2 & 3)		36.72	2005	4.44	4.13	--	0.00
LAA 4	Nicholson (Tracts 1 & 4; Tracks 2 & 3)		71.63			5.85	--	71.63
	Squeque <sup>4</sup>	Former Lease 5002	372.24	2003	5.34	6.10	--	372.24
		Former Lease 5015		2003	5.19			
		Former Lease 5037 <sup>5</sup>		2003	5.39			
	Schall Powell		50.55	2003	5.11	5.62	--	50.55
LAA 5	Hatier (Tract 1)		92.17	2006	5.13	5.68	--	92.17
	Former Lease 5022		47.35	2003	5.10	5.74	--	47.35
	Clinkenbeard (Portion of Lot A)		57.19	2004	4.68	NE	5.39	--
LAA 7	Dumontier		8.21	2005	6.04	6.89	--	8.21
	Demonstration Reach	Former Lease 5807	113.03	2003	5.83	6.96	--	113.03
		Former Lease 5757		2003	5.81			
Jocko River Tributary and other Watershed Properties:								
North Fork Jocko River	North Fork Jocko River							
	Former Lease 5768 (Portion of)		35.80	2003	5.08	NE	5.70	--
North Valley Creek	North Valley Creek							
	Nicholson (Parcel A, Sanders County)		23.95	2005	5.09	5.02	--	0.00
Jocko Spring Creek	Jocko Spring Creek							
	Jefferson		45.15	2007	4.65	NE	5.21	--
Mission Creek	Mission Creek							
	Former McCleod Allotment		71.61	NA	NA	6.00	--	71.61
Finley Creek	Finley Creek							
	North Parcel, with Addition (Finley Creek Flats)		283.18	rev. 2004	2.98	NE	4.85	0
	Former Leases 5029, 5030 (Portions of)		47.75	2005	3.12	NE	4.79	0
	Burlington-Northern		20.11	NA	NA	NE	4.69	0
	Total ARCO Acreage Protected		1,759.32	TOTAL ARCO Mitigation Credit Acres				826.79

<sup>1</sup> Bold font and green background shading indicate parcels where field data were collected in 2018 to support HGM Assessments.

<sup>2</sup> Acres include only those within the Ecological Floodplain that would have the potential to qualify for mitigation credits.

<sup>3</sup> ARCO mitigation credits were only allotted to parcels where field data were collected in 2018 that also met the threshold HGM score of 5.39 to qualify for mitigation credits. A total of 800 credits or 800 acres is a requirement from the Consent Decree. Each acre acquired or restored above the threshold score (5.39) counts for one credit.

<sup>4</sup> The Cole and Eggert parcels were not evaluated using the HGM Assessment Method.

<sup>5</sup> The HGM score of 5.39 for the baseline assessment of Lease 5037 (underlined in the table above) was identified as the threshold score required for a parcel to qualify for ARCO mitigation credits.



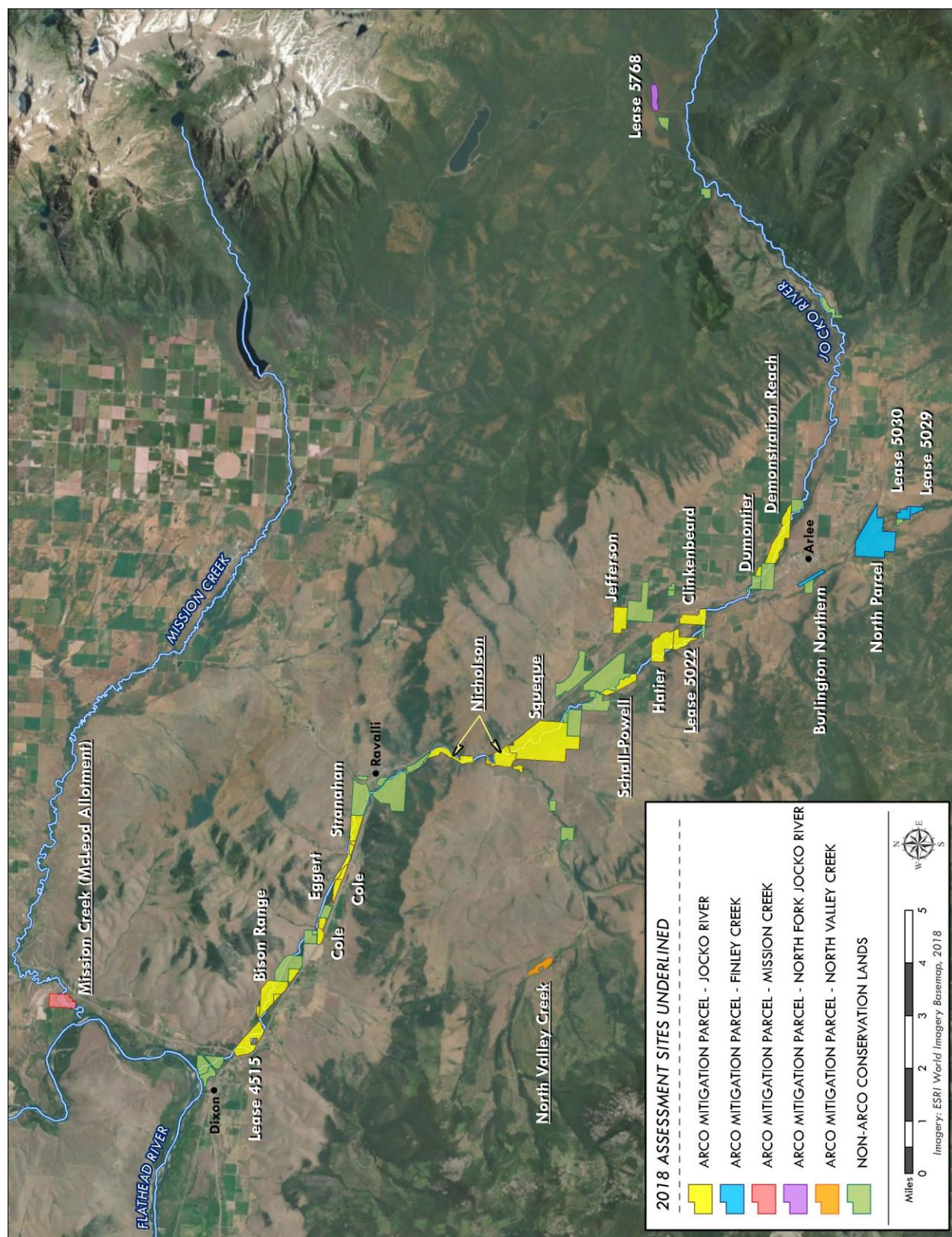


Figure 2. Overview of ARCO mitigation parcels and HGM Assessment locations in the Jocko River watershed and Mission Creek with other non-ARCO Conservation Lands. Underlined site names indicate locations where field-based HGM Assessments were conducted in 2018.



## Project History

In 1998, the Confederated Salish and Kootenai Tribes (CSKT) finalized a Consent Decree with the Atlantic Richfield Company (ARCO) to pay for restoration, replacement, and/or acquisition of injured natural resources in the Upper Clark Fork River Basin (UCFRB). The CSKT's *Riparian/Wetland Habitat and Bull Trout Restoration Plan: Parts I & II* (CSKT ARCO Settlement ID Team 2000) describes the process that was used to select the Jocko River watershed as the restoration target area due to its similarities to the UCFRB injury area including stream size, streamflow, hydrology, and species composition (CSKT 2008). The Consent Decree requires that the CSKT create 'up to 800 acres of newly constructed, restored, or enhanced wetlands or riparian areas' (CSKT 2003).

The Consent Decree also specified that CSKT would (CSKT 2003):

*...receive credit of one acre for each acre created, restored, or enhanced up to a quality of 2.3 as measured by the Functional Wetlands Area (FEWA) scale. Although it specifies the FEWA methodology as the means of accounting for the functional quality of the wetlands and riparian areas, FEWA is specifically designed for the range of conditions found in the Upper Clark Fork River Basin. Therefore, the Tribes, in consultation with the US Fish and Wildlife Service, will chose another more appropriate method that is regionally specific for the Jocko Watershed. This new method must be tied back to FEWA so an accounting currency can be established. The new method will be employed on routine functional assessment monitoring.*

The CSKT selected *A Regional Guidebook for Applying the Hydrogeomorphic Approach to Assessing Wetland Functions of Riverine Floodplains in the Northern Rocky Mountains* (HGM Assessment Method, Hauer and others 2002) as a replacement for the Functional Effective Wetland Area (FEWA) assessment method. A document, *Assessing Jocko River Wetland and Riparian Restoration under the ARCO Consent Decree* (CSKT 2004) describes the crosswalk method that was used to translate the FEWA score of 2.3 to an equivalent HGM score. The CSKT Lease 5037, located north of Arlee and south of Ravalli Canyon, was selected as an area that represented the FEWA threshold score of 2.3 and therefore qualifies for mitigation credit when scores for all eight HGM functions are summed. The baseline HGM score for Lease 5037 was 5.39; therefore, parcels receiving HGM scores of 5.39 or higher would qualify for one acre of ARCO credit for each acre in size. The United States Fish Wildlife Service (USFWS), as the agency overseeing the mitigation program, documented concurrence with this method for determining a threshold score in a letter from R. Mark Wilson, USFWS to Les Evarts, CSKT Fisheries Program Manager, dated October 18, 2004.

In 2003, the Confederated Salish and Kootenai Tribes (CSKT) began acquiring wetland and riparian lands in the Jocko River watershed on the Flathead Indian Reservation for the ARCO Mitigation Program. These lands were either acquired by the CSKT or were existing Tribal parcels where land uses were reassigned to meet mitigation requirements specified in the Consent Decree. As these lands were acquired, functional assessments using the HGM Assessment Method were conducted to determine a baseline score at each parcel. Baseline functional assessments of ARCO mitigation parcels occurred each year between 2003 and 2007 as new parcels were acquired or rededicated. ARCO mitigation parcels acquired after 2007 did not receive baseline HGM Assessments.

The following documents include results of the baseline HGM Assessments:

- *Report on the Hydrogeomorphic Functional Assessment of ARCO Wetland and Riparian Mitigation Lands* (CSKT 2005)
- *Addendum to the Hydrogeomorphic Functional Assessment of ARCO Wetland and Riparian Mitigation Lands – Report of HGM Assessments completed in 2004 and 2005* (CSKT 2006)
- *Addendum to the Hydrogeomorphic Functional Assessment of ARCO Wetland and Riparian Mitigation Lands – Report of HGM Assessments completed in 2006* (CSKT 2007)
- *DRAFT Addendum to the Hydrogeomorphic Functional Assessment of ARCO Wetland and Riparian Mitigation Lands – Report of HGM Assessments completed in 2006 and 2007* (unpublished report)

Subsequent updates to estimated changes in HGM scores have occurred since the baseline assessments and are described in the following reports:

- *Memorandum: Hydrogeomorphic (HGM) 2009 Status Update* (Geum 2009)
- *2011 Update of Hydrogeomorphic Functional Assessment of ARCO Wetland and Riparian Mitigation Lands and Management Plan* (CSKT 2011)

The Jocko River Master Plan (Master Plan) was published by the CSKT in 2008 and is the guiding document for restoration planning within the main stem Jocko River, building off the earlier *Riparian/Wetland Habitat and Bull Trout Restoration Plan, Parts I and II* (CSKT 2000). The Master Plan includes a framework for assessment and identifying appropriate protection measures as well as a framework for determining whether passive and/or active restoration measures are needed in protected lands (CSKT 2008).

Active restoration work at selected ARCO mitigation parcels began in the Jocko River in 2004 while the Master Plan was in development. Active restoration that has occurred at ARCO mitigation parcels includes the following:

- Demonstration Reach Phase 1 – 2004 and Demonstration Reach Phase 2 – 2008
  - Restoration actions included: channel realignment, reactivation of the floodplain, streambank bioengineering, floodplain revegetation, and vegetation preservation.
- Finley Creek Flats, Phase 1 – 2005 and Finley Creek Flats, Phase 2 – 2007 and 2008
  - Phase 1 restoration actions included: ditch regrading, ditch plug installation, pond regrading, experimental planting plots, and general restoration planting.
  - Phase 2 restoration actions included: channel realignment, streambank bioengineering, ditch plugs to restore hydrology to wetland areas, and revegetation.
- Nicholson – 2005 to 2015
  - Shrubs were transplanted into the floodplain on low elevation surfaces, relative to the Jocko River streambed elevation in 2005.
  - Additional floodplain plantings using an excavator mounted stinger occurred in Fall 2011 and Spring 2012.
  - Seeding former pasture areas occurred in Spring 2015.
  - A vegetated soil lift (approximately 200 feet long) that included live willow cuttings was constructed on the west bank (left bank, looking downstream) of the Jocko River near the downstream end of the parcel in 2010. The work was done in conjunction with the restoration work at the Squeque parcel, described below.

- Clinkenbeard – 2006
  - Restoration actions included: channel realignment, streambank bioengineering, slope stabilization, irrigation diversion updates, and floodplain revegetation.
- Squeque – 2008 to 2015
  - Floodplain burning occurred in former agricultural fields in 2008.
  - Restoration actions included: removal of car bodies from streambanks and streambank restoration, spring channel activation and restoration in Fall 2009 and Spring 2010.
  - Seeding in the norther portion of the parcel occurred in 2015 in conjunction with seeding work at the Nicholson parcel, described above.
- Schall Powell – 2008
  - Restoration actions included: constructing setback trenches along selected, eroding streambanks, removal of fill from a race track in the floodplain, and transplanting shrubs to fill removal areas and setback trenches.
- Hatier and Lease 5022
  - Prescribed burning the floodplain occurred in Spring 2009.

Land management practices were changed at all acquired ARCO mitigation lands to remove livestock and stop agricultural production where it occurred. Lands are now managed for conservation and habitat values and functions. To support this management, fences were installed or repaired around the perimeters of parcels to restrict livestock use and control vehicle access. Interior fences were removed between adjoining ARCO parcels. Noxious weed management is ongoing as needed at all parcels. Where houses, barns, corrals, outbuildings, and other infrastructure was present in the floodplain, these structures were removed.

In addition to ARCO mitigation parcels, the CSKT purchased or rededicated parcels for conservation and restoration purposes using funds from different sources. These additional conservation land purchases have increased the overall area of land that is now available to support natural floodplain processes in the Jocko River watershed. The following section describes the project area considered for the HGM Assessments.

## Project Area Overview

The HGM Assessment project area includes the main stem Jocko River floodplain, specifically the lower 22 miles from upstream of Arlee, Montana to the Jocko River confluence with the Flathead River near Dixon, Montana. In addition to the Jocko River, HGM Assessments were conducted at ARCO mitigation parcels along tributary streams including: North Fork Jocko River, Finley Creek, Jocko Spring Creek, Valley Creek, and North Valley Creek. One ARCO mitigation parcel where an HGM Assessment was conducted is located along Mission Creek, a tributary to the Flathead River, whose confluence is located approximately 2.75 river miles upstream from the confluence with the Jocko River. Figure 2 provides an overview of the ARCO mitigation parcels along the Jocko River main stem and tributary streams. Sites where field-based HGM Assessments were conducted have their names underlined in Figure 2.

## HGM Overview and Key Terms

The HGM Assessment Method evaluates riparian and wetland function at the landscape-scale and the wetland assessment area-scale.

A **landscape assessment area (LAA)** should capture features that are essential to the floodplain function in the area and the LAA extent should generally extend across the width of the contemporary (i.e. Holocene) floodplain and generally be 2 to 7 times longer (upstream and downstream) than its width (Hauer et al. 2002).

The Jocko River Master Plan (JRMP) defined an **ecological floodplain** along the lower main stem Jocko River, which serves as the outside extent of the LAAs for the HGM Assessments.

A **wetland assessment area (WAA)** is the 'project area' being evaluated, and for the purposes of this report, each ARCO mitigation parcel is a WAA.

Vegetation and ground **Cover Types** are delineated throughout the LAAs and WAAs to support assigning values to functional assessment variables and identifying field data collection locations. Table 3 below lists the cover types and their descriptions from the HGM Assessment Guidebook (Hauer et al. 2002).

Table 3. Cover type descriptions from the HGM Riverine Method (Hauer and others 2002).

Cover Type	Description
1	Mature conifer dominating the canopy, with interspersed mature cottonwood. Soils generally developing an A-horizon.
2	Mature cottonwood dominated (>6 m height and >10 cm dbh), may have early stages of conifers that have not reached the forest canopy or may be entirely devoid of conifers.
3	Immature pole cottonwood 2-6 m in height and <10 cm dbh. May also have interspersed of willow. Soils are generally cobble dominated with fine sediments accumulating over the surface.
4	Cottonwood or willow seedlings and early seral stages up to 2 m in height. Substrate often with exposed cobble, but may also include deposited fines from flooding. Generally, soils are unstained by organics, indicating very early soil development.
5	Filled or partially filled abandoned channel dominated by mix of willows, alder, shrubs, and interspersed herbaceous cover. Also, often the dominant Cover Type along edge of backwaters. Soils are generally composed of deeper fines (>10 cm) with a developing A-horizon.
6	Herbaceous vegetation dominated, but have interspersed of an occasional shrub (<10% cover). This Cover Type is often associated with filled side channel or abandoned back channel, but may be on any surface type.
7	Exposed cobble riverbed during base flow and inundated during most annual high flows. May have sparse herbaceous vegetation or an occasional cottonwood or willow seedling composing <10% cover.
8	Main-channel surface during base flow, may be in a single thread channel or may be braided w/ islands.
9	Off main channel, water at surface during base flow; includes springbrooks, oxbows, scour depressions and ponds, non-flow-through downstream connected channels, and disconnected side channels.
10	Agricultural field, may be a meadow or plowed, often planted and hayed, may have origin as a forested surface, but now logged, or may have been a natural meadow.
11	Domestic or commercially developed land including homes, buildings, gravel pits, transportation corridors, etc.

Variable subindices are evaluated at the landscape- and wetland-scale. **Landscape variables** are generally evaluated using spatial data, aerial photographs and other mapping, then verified during field visits. **Wetland variables** are evaluated based on data collected at each WAA.

Landscape variables include (Hauer et al 2002):

- **Proportionality of Landscape Features (Vcomplex):** Relative abundance of each cover type within the LAA compared to the reference standard wetland.
- **Floodplain Habitat Connectivity (Vhabcon):** Relative abundance of forested or potentially forested cover types (1-4) and connectivity of off-main channel waters such as side and backwater channels, floodplain scour pools, and ponds.
- **Geomorphic Modification (Vgeomod):** The amount and extent of modifications in the floodplain such as dikes, levees, riprap, bridges, and road beds.
- **Macrotopographic Complexity (Vmacro):** The distribution and relative abundance of off-main channel water features and their connectivity to the main channel.
- **Frequency of Surface Flooding (VsurfREQ):** Frequency of surface flooding in side channels, meander scrolls, abandoned channels, filled paleochannels, and fluvial depression wetlands.
- **Frequency of Subsurface Flooding (VsubREQ):** Frequency of flooding in disconnected side channels and other fluvial depressions due to subsurface flow.

Wetland variables include (Hauer et al 2002):

- **Proportional Landuse (Vlanduse):** Score are assigned to each cover type based on current land use.
- **Decomposition of Organic Matter (Vorgdecomp):** The presence and depth of an O-horizon and surface mineral soil layer, with the color value of the surface mineral soil layer are measured as an indicator of the amount of organic matter decomposition and nutrient cycling, that is occurring in the soil. Measured in cover types 1 to 6. By default, all areas of cover type 10 receive a score of 0.1 and all areas of cover type 11 receive a score of 0. Soils are not evaluated in cover types 7 to 9.
- **Tree Density (Vdtree):** A count of trees greater than six meters in height and greater than ten centimeters diameter at breast height (dbh). Measured in cover types 1 and 2 within a ten- by ten-meter plot.
- **Pole Cottonwood, Willow, Shrub, and Sapling Coverage (Vshrub):** The percent cover of shrubs, willows, and pole cottonwood as either the dominant coverage or the understory of a forested system; shrubs and saplings are less than six meters in height and less than ten centimeters diameter at breast height (dbh). Measured in cover types 1 to 5 within a five- by five-meter plot nested in the tree plot.
- **Herbaceous Plant Coverage (Vherb):** The percent cover of herbaceous plants. Measured in cover type 1 to 6 within a one- by one-meter plot, nested within the tree and shrub plot.
- **Large Wood Debris (Vlwd):** Frequency of wood greater than ten centimeters in diameter and greater than six meters in length. Measured only within cover type 7.
- **Percent Coverage by Native Plants (Vnpcov):** The weighted mean percent coverage of native plants within each of cover types 1 through 6 by vegetation layer.

The scores assigned to landscape and wetland variable and used to calculate eight functional indices, as follows (Hauer et al 2002):

- Function 1: Surface-Groundwater Storage and Flow
- Function 2: Nutrient Cycling
- Function 3: Retention of Organic and Inorganic Particles
- Function 4: Generation and Export of Organic Carbon
- Function 5: Characteristic Plant Community
- Function 6: Characteristic Aquatic Invertebrate Food Webs
- Function 7: Characteristic Vertebrate Habitats
- Function 8: Floodplain Interspersion and Connectivity

## Methods

Methods followed those described in *A Regional Guidebook for Applying the Hydrogeomorphic Approach to Assessing Wetland Functions of Riverine Floodplains in the Northern Rocky Mountains* (HGM Assessment Method) (Hauer and others 2002). Specific methods for delineating and mapping assessments areas, field data collection, and data analysis that were used for this project are described in the following sections.

### Landscape Assessment Areas

Landscape Assessment Areas were defined for baseline HGM Assessments. The ecological floodplain of the Jocko River main stem is the outside edge of the LAAs and geologic and hydrologic conditions in the river define the upstream and downstream extents of 7 LAAs along the Jocko River (CSKT 2005) (Figure 3). In 2018, the ecological floodplain boundary was revised using spatial data generated since the baseline HGM Assessments, including:

- Light Detecting and Ranging (LiDAR) elevation data (Watershed Sciences, Inc. 2008)
- National Agriculture Imagery Program (NAIP), True Color Aerial Imagery (USDA FSA 2009, 2011, 2013, 2015, 2017)
- Federal Emergency Management Agency (FEMA) National Flood Hazard Layer (NFHL) (US DHS FEMA 2018)

Using ESRI ArcGIS software and the LiDAR elevation data, a plane of the water surface elevation was projected across the floodplain and compared to ground surface elevations throughout the lower main stem Jocko River to generate a data layer of ground surface elevations relative to the water surface in the Jocko River. The relative elevation surface, baseline ecological floodplain boundary, 100-year floodplain, and recent aerial photos were reviewed to identify locations where the original ecological floodplain boundary corresponded with visible geomorphic features and/or vegetation community boundaries in aerial photographs. Locations with visible indicators of the ecological floodplain boundary, such as distinct vegetation community changes at slope breaks, often corresponded with an elevation of approximately 15 feet above the Jocko River water surface elevation. This relative elevation was used a guide to refine the location of the ecological floodplain boundary where historic logging or land uses have altered the vegetation community or where valley slope breaks are more gradual. Edits to the ecological floodplain boundary mapping were field verified in select locations during field data collection efforts.



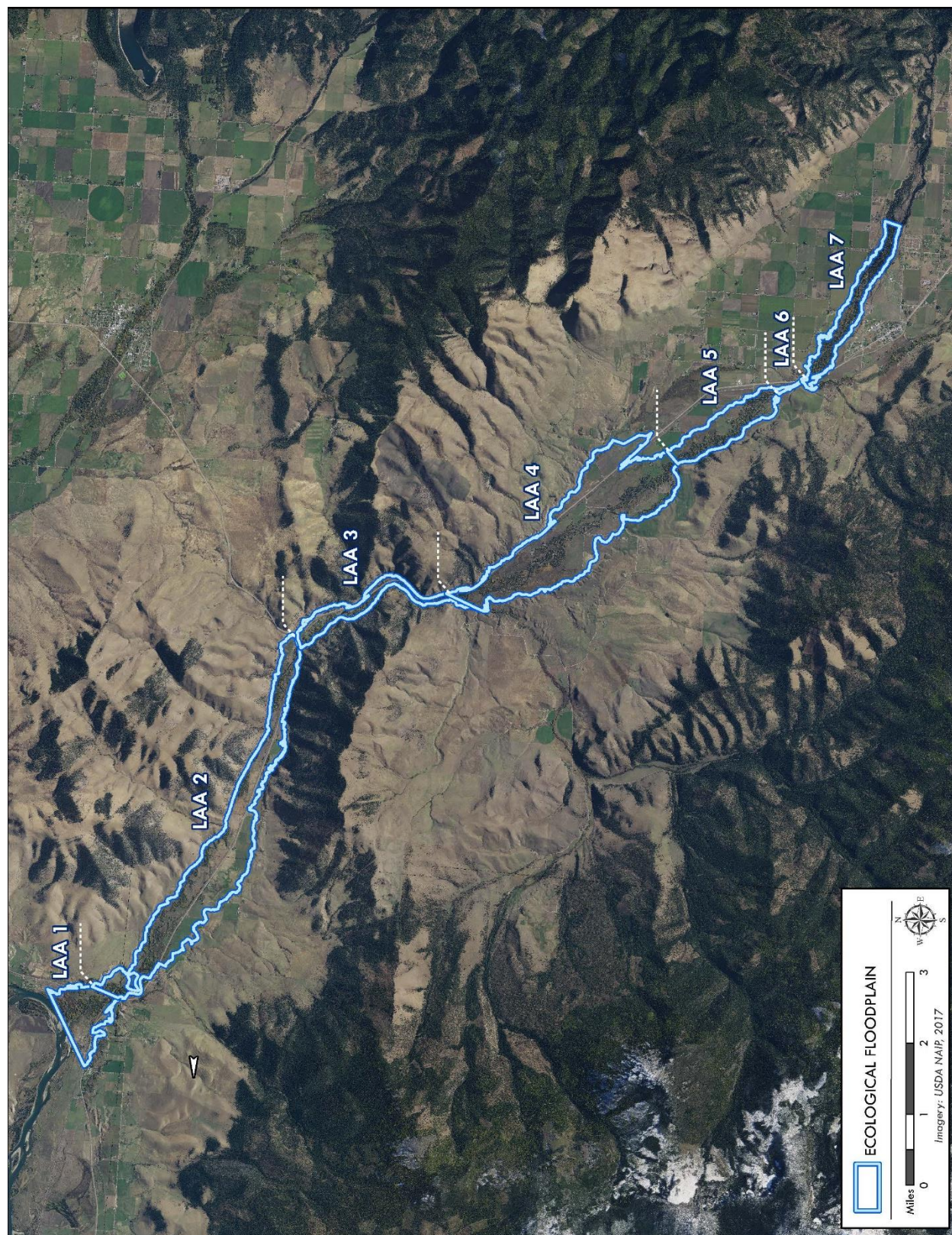


Figure 3. Overview of landscape assessment areas and the ecological floodplain along the lower main stem Jocko River.



For ARCO mitigation parcels in the North Fork Jocko River, North Valley Creek, Jocko Spring Creek, Finley Creek, and Mission Creek areas, the LAA boundaries generally correspond with the WAA boundaries as they did when baseline HGM Assessments were completed. Exceptions occur where distinct valley and/or geomorphic features that clearly indicate the extents of the functioning floodplain are present within the parcel boundary, and these features define the LAA and WAA extents. Any portion of ARCO mitigation parcels that occur outside of the ecological floodplain boundaries are not evaluated for the HGM Assessments are not considered for potential ARCO mitigation credits.

### Wetland Assessment Areas

The extents of WAAs were updated for the 2018 HGM Assessment based on survey data of property corners provided by CSKT. Some adjoining WAAs that had been assessed separately for baseline assessments were combined into one WAA, particularly where these adjoining parcels are managed as a single unit, including the Demonstration Reach (formerly Leases 5807 and 5757) and Squeque (Leases 5002, 5015, 5037). The Nicholson WAA consists of two discontinuous parcels of land, one located in LAA 3 and the other in LAA 4. For the 2018 HGM Assessment these two parts of the Nicholson parcel were split into separate WAAs so they could more accurately be assessed in the context of the LAA that each part is located in. The size (acres) of WAAs were also modified if the ecological floodplain boundary was revised within the WAA extent. Figure 2 shows an overview of the ARCO mitigation parcel WAA locations.

### Cover Type Mapping

In 2018, a spatial data layer of the baseline HGM cover type mapping was updated to reflect the current condition of cover type distributions and assignments within the Jocko River main stem, Finley Creek, North Fork Jocko River, and North Fork Valley Creek. New cover type mapping occurred within the Burlington Northern WAA along Finley Creek and within the McLeod WAA along Mission Creek that had not been previously mapped or evaluated using the HGM Assessment Method.

Data layers used to support mapping updates included the following:

- Light Detecting and Ranging (LiDAR) elevation data and a derived spatial data layer showing floodplain elevations relative to the river channel water surface elevation (Watershed Sciences, Inc 2008).
- Aerial photographs from the National Agriculture Imagery Program (NAIP) from 2017, 2015, 2013, 2011, and 2009 (USDA FSA 2017, 2015, 2013, 2011, and 2009).
- Parcel spatial data layer for ARCO and non-ARCO mitigation and conservation lands (CSKT unpublished data).

Within ARCO mitigation parcels, which are now managed for habitat and conservation, former agricultural lands (cover type 10) were re-mapped to riparian vegetation cover types. In areas where floodplain restoration projects occurred and woody vegetation is re-establishing in the floodplain, these areas were mapped as shrub communities (cover type 5). In former agricultural lands where passive restoration is occurring, or where woody vegetation is not yet establishing, these areas were mapped as herbaceous vegetation (cover type 6).



### Landscape Variables

Scores for landscape variables were evaluated in the office using the updated cover type mapping and NAIP aerial photographs (USDA FSA 2017, 2015, 2013, 2011, 2009). Scores for Vsurf and Vsub were updated in LAAs where restoration actions or natural processes have altered flood frequency. Field observations during data collection were used to verify scores assigned to landscape variables.

### Wetland Variables and Field Data Collection

Field data were collected during 2018 at a sub-set of ARCO mitigation parcels within the Jocko River main stem, Mission Creek, and North Valley Creek as indicated in Table 3. Field data collection methods followed those described in the HGM Assessment Guidebook (Hauer et al 2002) and were the same as the baseline HGM field data collection methods (CSKT 2005).

Land use was evaluated at each WAA and noted for the site as a whole. Based on the updated cover type mapping results, representative polygons of each of the cover types were selected for collecting vegetation and soils data. Data collection included the following:

- Within riparian conifer and cottonwood forests (cover types 1 and 2), nested vegetation sample plots were established to count tree stems by species in 10-meter by 10-meter plots.
- Absolute percent cover of shrubs by species was recorded in a 5-meter by 5-meter sub-plot.
- Absolute percent cover of herbaceous species was recorded in a 1-meter by 1-meter sub-plot.
- The presence and depth of an organic horizon and the surface mineral soil layer was observed in a soil pit and recorded. The dominant color value of the surface mineral soil layer using a Munsell soil color chart was recorded.
- Counts of wood debris on exposed alluvial surfaces (cover type 7) were recorded.

For each cover type, data were collected from a minimum of three sample plots located in representative locations throughout the WAA. In some cases, fewer than three sample plots were evaluated if few polygons were present and/or the total area of a particular cover type within the WAA was relatively small.

Following field data collection, sample plot data for each cover type were analyzed to determine the average values for each metric. These values were then extrapolated to the cover type as a whole within the WAA. Cover type metrics calculated for each WAA included: the average number of tree stems per cover type, average shrub cover, average herbaceous cover, average number of wood debris pieces, and average values for Organic Matter Decomposition Factor (OMDF) using soils data and a formula in the HGM Assessment Guidebook. Charts and tables in the HGM Assessment Method were used to derive scores for each wetland assessment variable using the average value of each metric collected from representative plot locations throughout the WAA.

Native plant composition was evaluated by first determining the proportion of native species in each vegetation layer (tree, shrub, and herbaceous), applying the score from the HGM Method to each layer, then averaging the scores for the layers to determine the native plant cover score for the cover type.

The updated landscape and wetland variable scores were used to calculate scores for each of the 8 HGM functional capacity indices, which were summed to generate an HGM score for each WAA.

## Office-Based Assessments

For ARCO mitigation parcels where field data were not collected, current HGM scores were estimated during an office-based assessment. Information used to support the office-based assessments included:

- Field data collected in 2018 at ARCO mitigation sites as reference data.
- Light Detecting and Ranging (LiDAR) elevation data and a derived spatial data layer showing floodplain elevations relative to the river channel water surface elevation (Watershed Sciences, Inc 2008).
- Aerial photographs from the National Agriculture Imagery Program (NAIP) from 2017, 2015, 2013, 2011, and 2009 (USDA FSA 2017, 2015, 2013, 2011, and 2009).
- Baseline assessment data for the WAAs.

Site visits during 2017 and 2018 occurred at all the ARCO mitigation sites, and observations of hydrologic and vegetation community conditions during these visits were also used to inform the office-based HGM assessments.

## Findings

Of the 9 ARCO mitigation parcels which correspond with 10 WAAs that were assessed in the field using the HGM Assessment Method in 2018, 8 of the WAAs achieved the threshold HGM score of 5.39 that qualifies for mitigation credit. This resulted in a total of 826.79 credit acres for the ARCO mitigation program.

Details of the HGM Assessment findings are reported in the following sections. Landscape-scale findings, including updates to the ecological floodplain boundaries, are described first, followed by details of wetland assessment area findings.

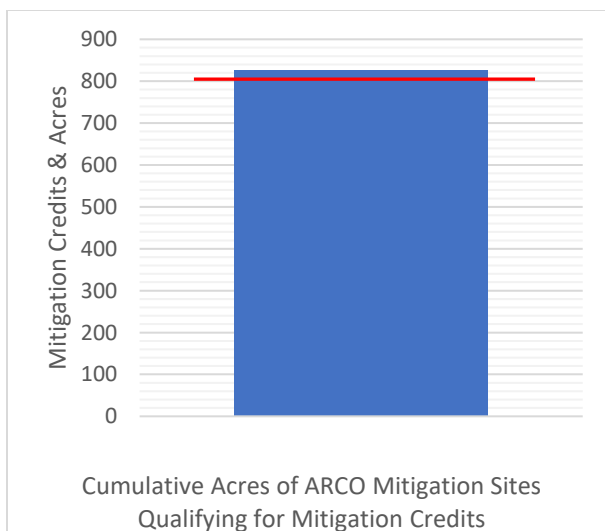
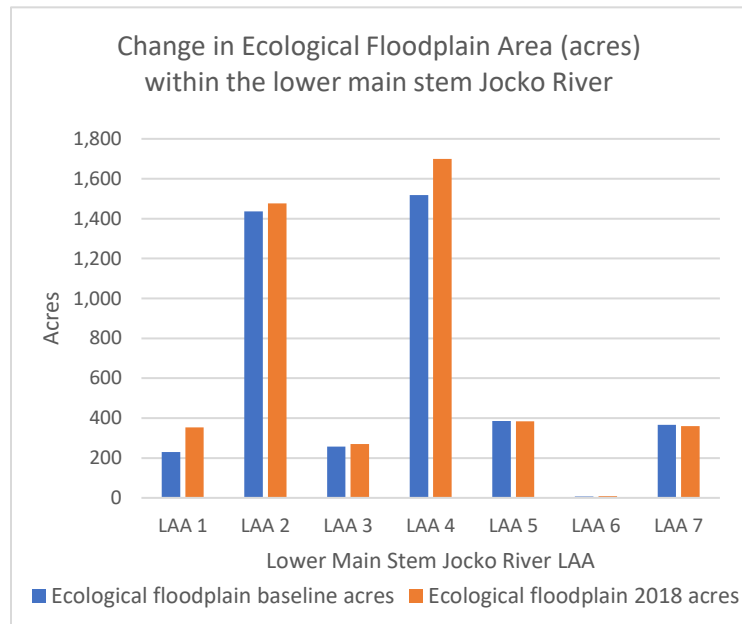


Figure 4. Cumulative ARCO mitigation credits from ARCO mitigation parcels meeting the HGM Score to qualify for credits; 800 credits (red line in the chart) are required under the Consent Decree.

## Ecological Floodplain and Landscape Assessment Areas

Along the main stem Jocko River, modifications to the ecological floodplain boundary are reflected in differences in the total area of each LAA between the baseline assessment and the 2018 assessment.

Table A- 1 in Appendix A summarizes the area of each LAA, by cover type. The LAAs with the largest changes in total area (acres) include those with the widest floodplains where the valley slopes are gradual and historic clearing of woody vegetation from the floodplain has occurred. In LAA 1, the ecological floodplain was expanded more than 100 acres to include low elevation surfaces at the confluence of the Jocko River with the Flathead River. Residential development in the town of Dixon, Highway 93, and the railroad occur within the expanded ecological floodplain (Figure 5). In LAA 4, the ecological floodplain was expanded



approximately 180 acres to include more of the Jocko Spring Creek floodplain east of the Jocko River (Figure 6). In LAA 7, the overall area decreased by 7 acres; on the north side of the floodplain, additional lower elevation floodplain surfaces were included in the ecological floodplain and some higher terraces that were not easily discernable in aerial images were excluded from the ecological floodplain (Figure 7). The ecological floodplain was modified less in the other Jocko River main stem LAAs, where more visible geomorphic features are present, corresponding with ecological floodplain boundary.

The ecological floodplain was modified in the North Valley Creek LAA and WAA. At the downstream end of the North Valley Creek parcel, a valley slope with conifers abuts the western floodplain. During the 2018 Assessment, it was determined that the slope is too high, relative to the stream channel, to function as part of the floodplain and therefore it was excluded from the LAA and WAA extents. At North Fork Jocko River, Jocko Spring Creek, Finley Creek, and Mission Creek the LAA extents correspond with the parcel boundary and WAA extents for each assessment. Only minor changes were made to refine parcel boundaries using survey data or GPS data (Table A- 2).



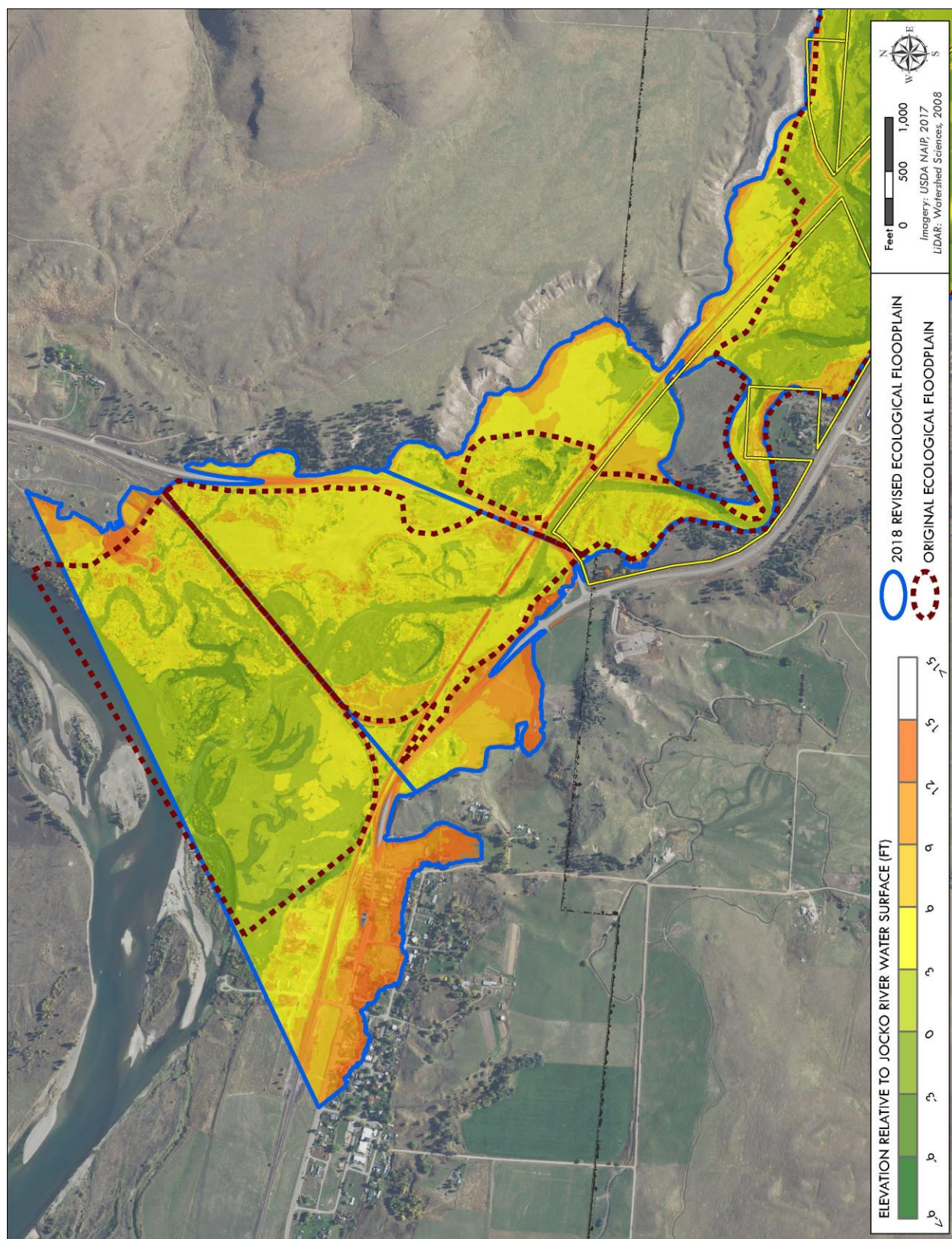


Figure 5. Changes to the ecological floodplain boundary in LAA 1 of the Jocko River main stem.



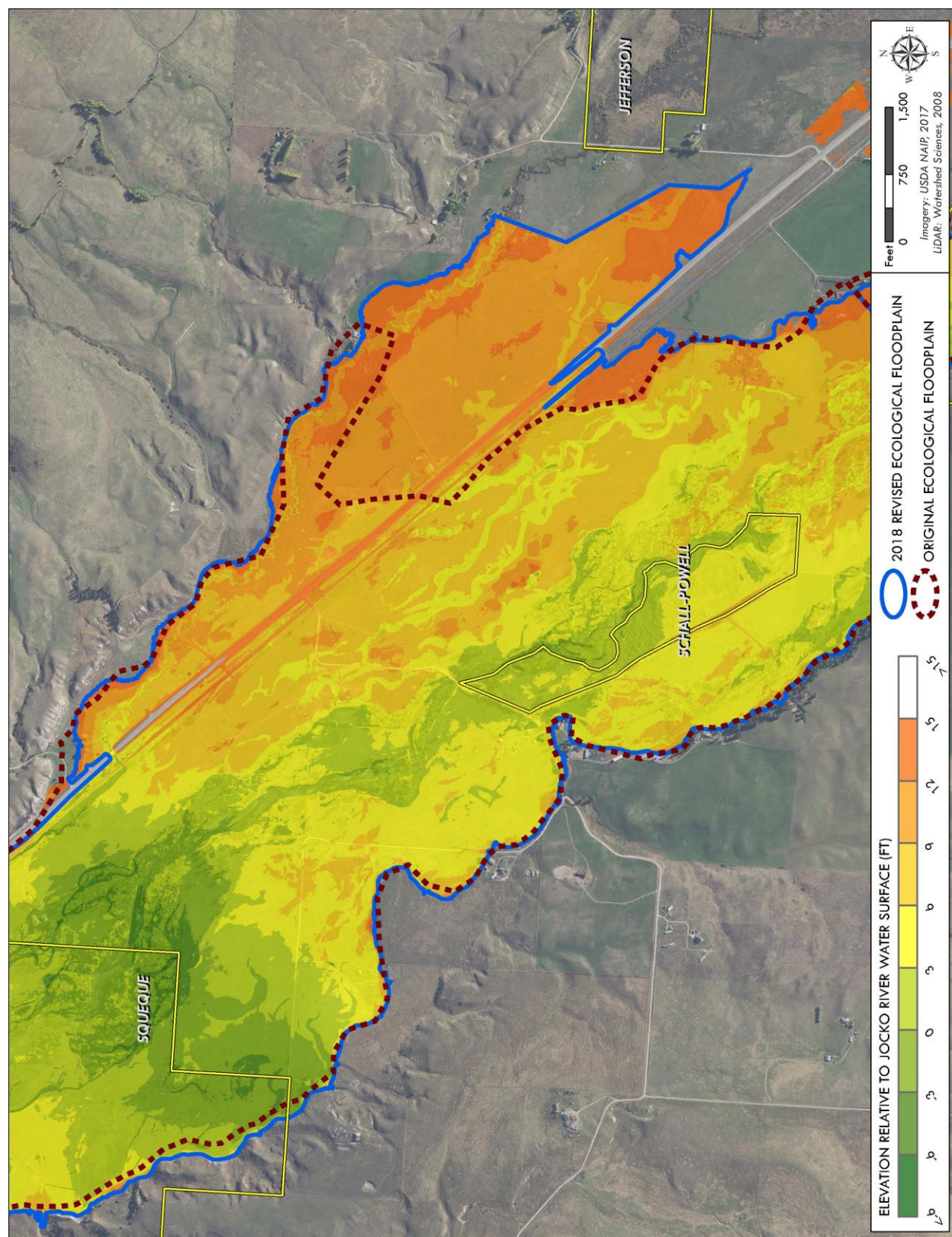


Figure 6. Changes to the ecological floodplain boundary in LAA 4 of the Jocko River main stem.



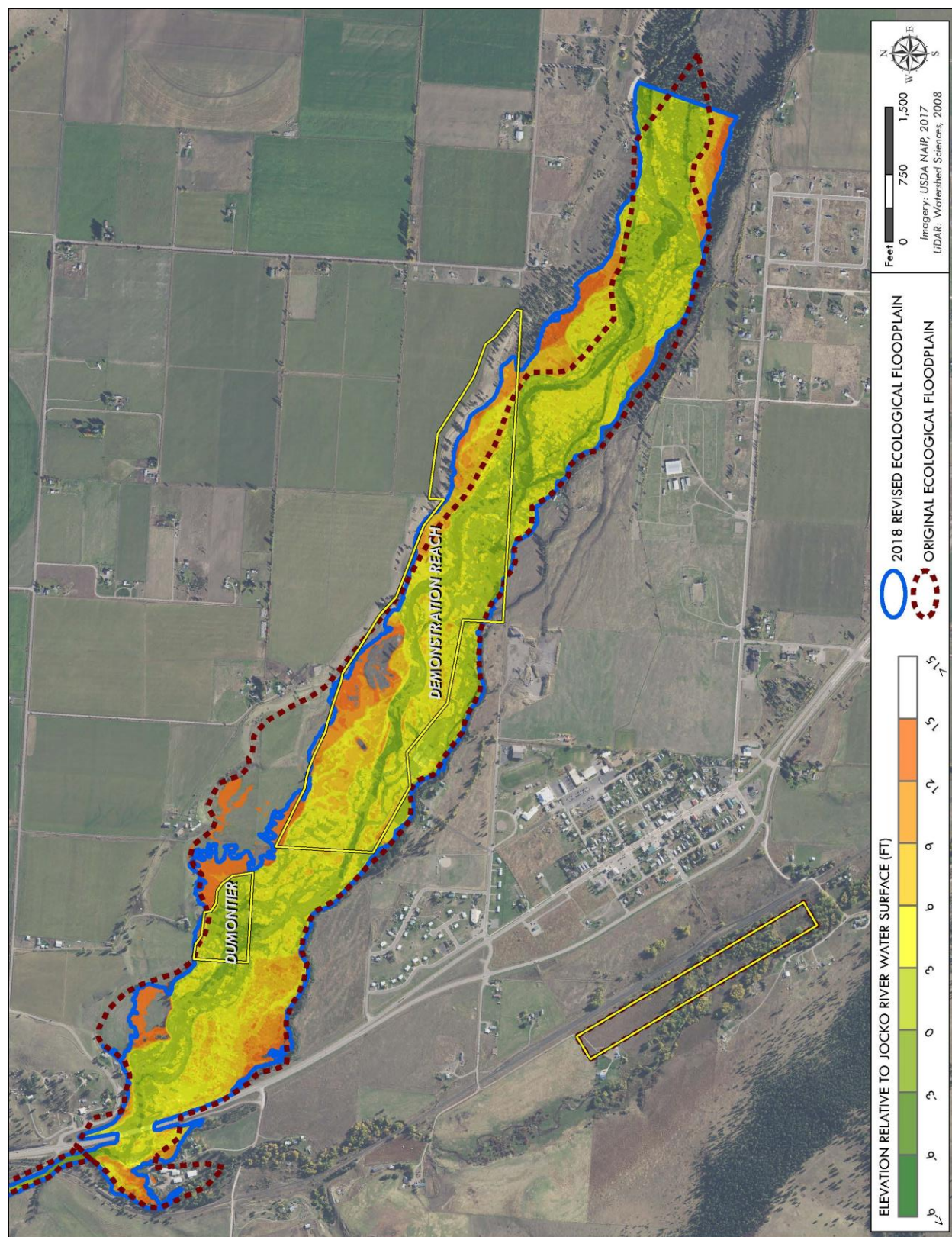


Figure 7. Changes to the ecological floodplain boundary in LAA 7 of the Jocko River main stem.

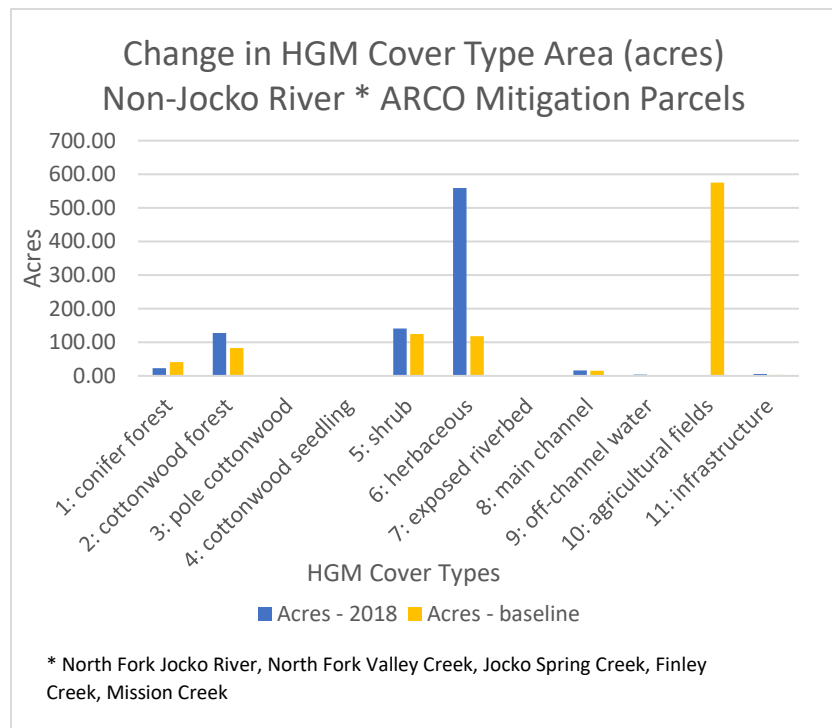
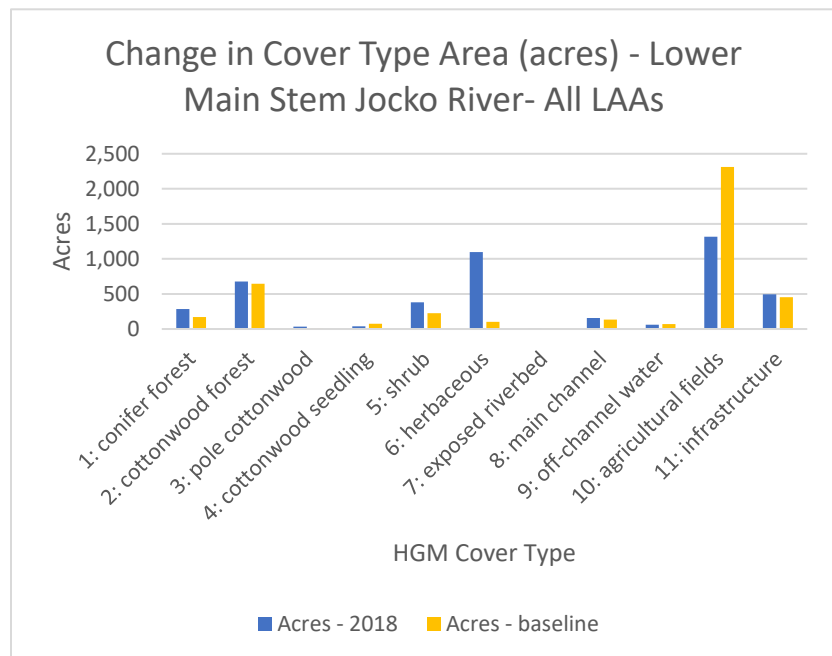
## Landscape Assessment Area Variable Updates

Using the updated cover type mapping results for the Jocko River main stem LAAs, the landscape-scale variables were updated to reflect changes since the baseline assessment including:

- Restoration actions that increased hydrologic connectivity between the Jocko River and floodplain, and
- Active and passive revegetation that restored native riparian vegetation communities in the Jocko River floodplain.

Landscape variable scores are summarized Table A- 3 for the Jocko River main stem and in Table A- 4 for other Jocko watershed and Mission Creek areas.

Score changes for proportionality of landscape features (Vcomplex) were driven by a decrease in the overall area of agricultural lands (cover type 10) in the floodplain due to active restoration and land management changes that allow these areas to now be classified as riparian vegetation cover types, generally cover type 5 or 6. While the area of agricultural land in the floodplain has decreased, there is now an overabundance of herbaceous vegetation communities (cover type 6) when compared to other reference floodplain wetland systems in the HGM Guidebook. Therefore, Vcomplex scores were rated higher than the baseline assessment for LAAs where the area of agricultural lands decreased, but if most of the area was remapped as herbaceous vegetation communities, the score was not increased as much as where active restoration is converting



these areas to woody vegetation cover types. Woody vegetation is likely to continue establishing in portions of the former agricultural lands due to active restoration measures such as planting, along with natural recruitment of cottonwoods, willows, and other shrubs in floodplain areas that are hydrologically connected to the river.

Floodplain habitat connectivity (Vhabcon) scores improved in LAAs 4 and 5 where land use changes have allowed natural channel migration to occur. Channel avulsions and new side channels forming in some locations are increasing water dispersion between floodplain wetlands. In LAA 7, restoration actions restored floodplain connectivity and sinuosity in the Demonstration Reach, improving the score for Vhabcon for the LAA as a whole.

Scores for geomorphic modification (Vgeomod) improved in LAA 4 due to the removal of fill material associated with an old race track berm at the Schall Powell parcel and the removal of car body riprap at the Squeque parcel. In the ARCO mitigation parcels in LAA 4, the Jocko River channel is now allowed to naturally adjust and migrate through the floodplain with the removal of some of the geomorphic modifications. In LAA 7, the Demonstration Reach restoration project raised the channel bed elevation and removed levees along the Jocko River to restore floodplain connectivity, improving the score for Vgeomod. These actions in LAA 4 and 7 also resulted improved scores for the frequency of surface flooding (Vsurfreg) and the frequency of subsurface flooding (Vsubfreq). The score for the frequency of surface flooding improved in LAA 5 due to restoration actions at the Clinkenbeard WAA where a diversion structure was improved to better manage flows in the main channel and those diverted through an irrigation canal and streambank bioengineering structures were installed along an eroding bank to restore vegetative cover.

Macrotopographic complexity scores (Vmacro) improved only in LAA 7 in association with the restoration project that created connected side channels and seasonal overflow channels that disperse water out of the channel into the floodplain and also route water back into the channel from the floodplain.

### Wetland Assessment Areas Findings

The findings of HGM Assessments for ARCO mitigation sites, WAAs, are provided in the following sections, including details of changes to wetland assessment variable scores and functional capacity index scores. The results of HGM Assessments based on field data collection in 2018 are discussed first followed by the results of office based HGM Assessments.

### Field Assessments Findings

#### *Nicholson – Jocko River main stem, LAA 3 and LAA 4*

The Nicholson parcel consists of two separate pieces of the land, the south part is located in LAA 4 and the north part is located in LAA 3. The south and north parts of the Nicholson WAA were each assigned separate HGM Assessment functional capacity index scores to reflect the differences in the overall landscape where they occur. Field data were collected from cover type polygons from both the south and north portions of the Nicholson WAA and pooled to evaluate WAA variables, and the LAA variable scores were used for each respective location.

The Nicholson South portion of the WAA is 71.6 acres and received an HGM score of 5.85 in 2018 which qualifies for 71.6 mitigation credits for each acre of the WAA. The Nicholson North portion of the WAA is 36.7 acres and received an HGM score of 4.13 in 2018 which does not qualify for mitigation credits.



The baseline HGM score for the Nicholson parcel as a whole, including the north and south sections, in 2005 was 4.43 (Table A- 7, Table A- 9).

The south portion of the Nicholson WAA occurs in LAA 4 which includes a wider portion of the Jocko River floodplain with a meandering channel pattern and connected side channels. The floodplain narrows as the river flows north toward Ravalli Canyon and LAA 3. This portion of the WAA also includes the confluence of Valley Creek with the Jocko River. The Valley Creek portion of the WAA extends outside of the Jocko River ecological floodplain; however, all of the Valley Creek floodplain in the Nicholson parcel was included in the WAA for the baseline assessment and was included again for the 2018 assessment. Prior to acquisition, the western floodplain in the south portion of the Nicholson parcel was hayed and may have been grazed seasonally. After acquisition, shrub planting occurred in the east floodplain as well as prescribed burning and reseeding to re-establish native vegetation in former hay fields. The east side of the floodplain occurs between the river and the railroad and the existing shrub vegetation community continues to be managed for natural vegetation cover.

The north portion of the Nicholson WAA is located within Ravalli Canyon (LAA 3) where the railroad and highway, located east of the Jocko River, restrict the floodplain area and limit hydrologic connectivity in the narrow canyon. Prior to acquisition, the North portion of the Nicholson WAA was managed for seasonal grazing. After acquisition, the removal of grazing is allowing woody vegetation to expand in the narrow floodplain. However, the naturally narrow canyon and continued presence of infrastructure limits the amount of floodplain development and reconnection that is possible.

For the Nicholson WAA as a whole, land use (Vlanduse) and decomposition of organic matter (Vorgdecomp) were the highest scoring wetland variables which also had the greatest improvement in scores due to the conversion of nearly all former pasture and hay fields to riparian vegetation cover types and management for natural processes and habitat. Vlanduse increased from 0.55 to 0.94. Agricultural lands (cover type 10) receive an automatic score of 0.1 on a scale of 0 to 1 for decomposition of organic matter according the HGM Assessment Method; because these areas were reclassified to riparian cover types in 2018, the depth and color of the soil was evaluated and Vorgdecomp increased from 0.48 to 0.93 in the Nicholson WAA in 2018.

Scores for density of trees (Vdtree), cover of shrubs (Vshrub), and native plant composition remained nearly the same as the baseline condition (0.50 and 0.82, respectively). The score for herbaceous cover (Vherb) increased to 1.0 from the baseline score of 0.85. The score for large wood debris (Vlwd) increased from 0 to 0.17 due to a larger area of exposed alluvial surfaces in the channel, along with the presence of woody debris on these surfaces which was not observed for the baseline assessment.

Generation and export of organic carbon is the highest scoring function in both the south and north portions of the WAA (0.68 and 0.81, respectively) due to relatively high scores for shrub cover (Vshrub) and herbaceous cover (Vherb) that contribute organic matter to the system and relatively high scores for frequency of surface flooding (VsurfREQ) that distribute accumulated organic matter in the floodplain during flood events.

In the Nicholson South WAA, scores for several of the functional capacity indices improved from the baseline assessment, including surface groundwater storage and flow, nutrient cycling, retention of organic and inorganic particles, and floodplain interspersed and connectivity. Increased scores for landscape variables were driving factors for the functional improvements. In the Nicholson South WAA,

all but one landscape variable score improved from the baseline condition with the frequency of surface and subsurface flooding improving the most.

In the Nicholson North WAA, nutrient cycling was the only function that improved from the baseline condition due to the conversion of former grazing lands to riparian vegetation cover types and associated improved scores for decomposition of organic matter in soils (Vorgdecomp). The decrease in scores for other functions is due to removing the influence of the landscape variable scores for LAA 4 and using the landscape variable scores for LAA 3 that reflect the existing, altered condition of the LAA, rather than an actual decrease in floodplain function.

*Squeque – Jocko River main stem, LAA 4*

The Squeque WAA is 372 acres and received an HGM score of 6.10 in 2018, resulting in 372.24 mitigation credits for each acre of the WAA. The baseline HGM scores for each of Squeque parcels in 2003 were as follows: Lease 5002: 5.35, Lease 5015: 5.19, and Lease 5037: 5.39.

At the time of the baseline assessment, the Squeque WAA consisted of three separate leases that were independently assessed. In coordination, the CSKT and USFWS selected Lease 5037 as the representative parcel whose HGM score of 5.39 serves as a threshold score (cumulative score including all eight HGM functions) that qualifies for mitigation credit according to the Consent Decree. Since acquisition, interior fences were removed and the three parcels are managed as one property. Restoration actions since acquisition have included restoration of a spring creek channel in the northwest floodplain, removal of car body riprap from Jocko River streambanks, and regrading and reconnection of floodplain ponds in the southeast floodplain.

Similar to other ARCO mitigation sites in 2018, the highest scoring and most improved wetland variables at the Squeque WAA were land use (Vlanduse) and decomposition of organic matter (Vorgdecomp) due to the conversion of nearly all former pasture and hay fields to riparian vegetation cover types and management for natural processes and habitat. Scores for Vlanduse increased from an average of 0.57 to 0.98 and scores for Vorgdecomp increased from an average of 0.46 to 0.94. Scores for tree density (Vdtree), shrub cover (Vshrub), herbaceous cover (Vherb), and native plant cover (Vnpcov) remained similar to the baseline conditions (0.80, 0.96, and 0.93, respectively). The score for large wood debris (Vlwd) improved to 0.15, an increase from 0 for the baseline scores at former Leases 5015 and 5037, due to an additional 5 acres of exposed alluvial surfaces being present in the channel, along with the presence of woody debris on these surfaces. Only Lease 5002 had woody debris present at the time of the baseline HGM Assessment.

In 2018, the highest scoring function in the Squeque WAA is generation and export of organic carbon (0.87) and the most improved function was nutrient cycling (baseline average: 0.55 to 0.75). Restoration work to remove geomorphic modifications and restore spring creek channels in the Jocko River floodplain contribute to improved scores for the frequency of both surface and subsurface flooding in LAA 4 overall, but also within the Squeque WAA. Near the downstream end of the WAA, side avulsions and head cutting are occurring and being allowed to continue as a passive restoration technique, letting the river work itself through the floodplain.

*Schall Powell – Jocko River main stem, LAA 4*

The Schall Powell WAA is 50.55 acres and received an HGM score of 5.62 in 2018, resulting in 50.55 mitigation credits for each acre of the WAA. The baseline HGM score for the Schall Powell parcel in 2003 was 5.11.

Following acquisition of the Schall Powell WAA, grazing and other agricultural uses were stopped, and in 2008, restoration activities were implemented at the site. Restoration treatments included removing fill associated with a racetrack that had been built in the southern floodplain, constructing vegetated setback trenches adjacent to three eroding streambanks, and transplanting shrubs to the setback trenches to restore woody vegetation cover along the streambanks. Removing the racetrack berm fill increased hydrologic connectivity in the southern portion of the floodplain by allowing over bank flows to access the floodplain. The setback trenches and associated revegetation increased the cover of woody vegetation along the treatment streambanks.

In 2018, the highest scoring and most improved wetland variables at the Schall Powell WAA were land use (Vlanduse) and decomposition of organic matter (Vorgdecomp) due to the conversion of nearly all former pasture and hay fields to riparian vegetation cover types and management for natural processes and habitat. The score for Vlanduse improved from 0.4 to 0.99 and the score for Vorgdecomp improved from 0.28 to 0.95. The scores for tree density (Vdtree) decreased from 0.90 to 0.7. The score for tree density may be lower with the loss of some trees near the channel; however, younger age classes of trees and shrubs are present in the floodplain and the score for shrub cover (Vshrub) increased from 0.62 to 0.70. Herbaceous cover (Vherb) remained similar to the baseline conditions, decreasing from 1.0 to 0.95. The score for native plant cover (Vnpcov) decreased from 0.64 to 0.23, due largely to the number of non-native species in the herbaceous vegetation community. All observed tree and shrub species in the Schall Powell WAA were native species, but very few native species are present in the herbaceous vegetation layers. Introduce grasses and forbs are most common the herbaceous layer including reed canarygrass (*Phalaris arundinacea*), Kentucky bluegrass (*Poa pratensis*), prickly lettuce (*Lactuca serriola*), and common mullein (*Verbascum thapsus*).

The score for large wood debris (Vlwd) decreased from 0.25 to 0.15 and while nearly 1 more acre of exposed alluvial surfaces was present in the channel, the presence of woody debris on these surfaces overall was lower than the baseline condition.

In 2018, the highest scoring functions in the Schall Powell WAA were generation and export of organic carbon (0.82), surface-groundwater storage and flow (0.79), and floodplain interspersation and connectivity (0.78). Nutrient cycling was the most improved function at the Schall Powell WAA, with the score increasing from 0.45 to 0.72. Restoration work to remove berms and fill material associated with a racetrack in the floodplain improved hydrologic connectivity. Shrubs transplanted in setback trenches behind eroding streambanks are establishing and forming increased cover of shrub species along the bankline.

*Hatier – Jocko River main stem, LAA 5*

The Hatier WAA is 92.17 acres and received an HGM score of 5.68 in 2018, resulting in 92.17 mitigation credits for each of the WAA. The baseline HGM score for the Hatier parcel in 2006 was 5.14.

At the time of the baseline assessment, a private residence and outbuildings were located in the center of parcel. Since acquisition, the house and other buildings have been removed from the property, fences have been repaired or installed to remove grazing, and land use has changed to management for conservation and habitat values.

In 2018, the highest scoring and most improved wetland variables at the Hatier WAA were land use (Vlanduse) and decomposition of organic matter (Vorgdecomp) due to the conversion of nearly all former pasture and hay fields to riparian vegetation cover types and management for natural processes and habitat. The score for Vlanduse increased from 0.53 to 1.0 and the score for Vorgdecomp increased from 0.45 to 0.98. The score for large woody debris also improved markedly from the baseline assessment of 0 to 0.42; the area of exposed deposition features in the WAA only increased by 0.5 acres, but 16 pieces of large wood debris were found on one of these surfaces, compared with no large woody debris being observed at the baseline assessment.

Scores for tree density (Vdtree) and shrub cover (Vshrub) decreased in the Hatier WAA from the baseline assessment; Vdtree decreased from 0.90 to 0.80 and Vshrub decreased 0.92 to 0.67. Rather than trees density and shrub cover actually decreasing, some areas of scattered tree cover that had been used for seasonal pasture were mapped as tree and/or shrub-dominated cover types in 2018, but because these areas had sparse and scattered cover of woody species, they lowered the scores for the WAA overall.

In 2018, the highest scoring functions in the Hatier WAA were generation and export of organic carbon (0.77), characteristic vertebrate habitats (0.74), nutrient cycling (0.73), and characteristic plant community (0.73). The most improved function was nutrient cycling, up from 0.50 to 0.73. Improved frequency of surface flooding and the presence of diverse vegetation communities in the floodplain contribute to these functions. The Hatier WAA had the highest score for native plant cover (an increase from 0.64 to 0.74) measured in all the 2018 assessment sites, which also contributes to the functions for characteristic plant community and floodplain habitat for vertebrate species.

*Lease 5022 – Jocko River main stem, LAA 5*

The Lease 5022 WAA is 47.35 acres and received an HGM score of 5.74 in 2018, resulting in 47.35 mitigation credits for each acre of the WAA. The baseline HGM score for the Lease 5022 parcel in 2003 was 5.10.

At the time of the baseline assessment, the portion of the Jocko River within the Lease 5022 WAA was considered to be in reference condition for this reach of the river. Since acquisition, Lease 5022 has been managed for conservation and habitat values. Management actions focused on changing land use in the eastern floodplain from haying and grazing to management for natural vegetation communities. Fences have been constructed to restrict livestock access and vegetation management has included controlled burning and noxious weed control.

Because of the change in land use that removed grazing and haying, all former agricultural land (cover type 10), was re-mapped as native vegetation cover types. The eastern lobe of the WAA was mapped

as herbaceous vegetation (cover type 6) in 2018, and includes a matrix of emergent wetland and drier grass-dominated vegetation communities. Additional acres of mature cottonwood forest were mapped in the northern floodplain on the east side of the Jocko River, where scattered cottonwoods remain present. The area of shrub-dominated vegetation (cover type 5) decreased where these areas were considered to part of the adjacent mature cottonwood community. Sediment transport in the reach resulted in new areas of exposed depositional surfaces (cover type 7) which were not present at the baseline assessment.

Scores for land use (Vlanduse) and decomposition of organic matter (Vorgdecomp) improved the most for Lease 5022, both due to the actual change in land use and the corresponding changes in cover type assignments. The score for Vlanduse increased from 0.67 to 0.99 in 2018. Agricultural lands receive an automatic score 0.1 on a scale of 0 to 1 for decomposition of organic matter according the HGM Assessment Method; because these areas were reclassified, the depth and color of the soil was evaluated and the score for Vorgdecomp increased from 0.64 to 0.99 in 2018.

The score for large wood debris (Vlwd) increased from 0 to 0.25 because exposed depositional surfaces are now present in the WAA and large wood had been recruited to these surfaces for the 2018 assessment.

Tree density increased in mature cottonwood communities, increasing the score for tree density (Vdtree) from 0.64 to 0.90. The score for herbaceous cover (Vherb) increased slightly from 0.88 to 0.98 due increased cover in nearly all the cover types. The score for shrub cover (Vshrub) decreased slightly from 0.90 to 0.80 with slightly lower shrub cover in the understory of the mature cottonwood communities that were formerly classified as agricultural lands. The score for composition of native plants (Vnpcov) declined only slightly from 0.68 to 0.62. All trees and shrubs observed in the Lease 5022 WAA are native species; however, the herbaceous community includes introduced forbs and grasses as well as some noxious weeds. Common introduced species included reed canarygrass (*Phalaris arundinacea*), timothy (*Phleum pratense*), quackgrass (*Elymus repens*), and orchard grass (*Dactylis glomerata*). Herbaceous dominated areas had the highest cover of noxious weed species, average 16 percent cover, including Canada thistle (*Cirsium arvense*) and oxeye daisy (*Leucanthemum vulgare*).

Scores for all functional capacity indices increased from the baseline assessment at Lease 5022. The score for nutrient cycling improved the most, an increase of 0.22 points from 0.54 to 0.76, due to improved scores for tree density (Vdtree) and decomposition of organic matter (Vorgdecomp). The scores for all other functional capacity indices improved by less than 0.1 points. Removing agricultural and grazing uses from the Lease 5022 WAA is allowing herbaceous wetlands to recover in the northeast lobe of the parcel and allowing woody riparian vegetation communities to expand in the floodplain. Natural processes in the Jocko River are supporting some re-working of the streambanks so that new sediment deposition is occurring and supporting continued colonization and establishment of young age classes cottonwood and shrub vegetation on depositional surfaces.

*Dumontier – Jocko River main stem, LAA 7*

The Dumontier WAA received an HGM score of 6.90 in 2018, resulting in 10.42 mitigation credits. The WAA received a baseline score of 6.04, representing a highly functioning site that exceeded the score for receiving mitigation credits. The WAA has been managed for conservation and habitat values since the baseline assessment. A fence along the northern property boundary separates the WAA from an adjacent pasture and excludes livestock access to the WAA. The Dumontier WAA is located downstream of the Demonstration Reach WAA where a two-phase restoration project was implemented in 2004 and 2008 to restore floodplain connectivity and function, see the Demonstration Reach Section below.

At the time of the baseline assessment, the Dumontier Parcel consisted primarily of native shrub and herbaceous riparian vegetation cover types (cover types 5 and 6) with light grazing as the land use. Conservation and preservation of the intact riparian vegetation communities and removal of livestock grazing have allowed natural processes to continue to function in the WAA and resulted in an improved score for the WAA variable land use (Vlanduse) from 0.86 to 1.0.

In 2018, higher resolution aerial photographs and refined mapping of the WAA extents resulted in identifying areas of conifer, mature cottonwood, developing cottonwood and shrub, and colonizing vegetation communities (cover types 1, 2, 3, and 4). The addition of tree-dominated cover types corresponds with the improved score for tree density (Vdtree), an increase from 0 to 0.4, because tree-dominated cover types were not evaluated for the baseline assessment. The scores for shrub and herbaceous cover (Vshrub and Vherb) declined slightly with inclusion of the additional woody vegetation cover types because the understory shrub and herbaceous cover in conifer, mature cottonwood, and colonizing depositional surfaces (cover types 1, 2, and 4) was sparser than the representative vegetation communities used to generate the HGM ratings. The score for Vshrub decreased from 1.0 to 0.96 and the score for Vherb decreased from 1.0 to 0.91. The score for composition of native plants (Vnpcov) declined from 0.77 to .62 due to a lower abundance of native species in the herbaceous vegetation layer in cover types 1, 3, and 4. In the Dumontier WAA, all trees and shrubs are native species, but noxious weeds are common in colonizing depositional features (cover type 4) along the Jocko River. In other cover types, noxious weeds averaged 10 percent or less canopy cover. Introduced grasses and forbs, such as reed canarygrass (*Phalaris arundinacea*), Kentucky bluegrass (*Poa pratensis*), and teasel (*Dipsacus fullonum*) are common in the herbaceous vegetation layer in many of the cover types.

The score for large wood debris (Vlwd) declined from 0.55 to 0.35 in association with a decline in the area of exposed alluvial surfaces (cover type 7), and corresponding lower count of woody debris on these surfaces. Woody debris is present in the floodplain, but some exposed alluvial surfaces that were barren at the time of the baseline assessment have either scoured and were lost or have been colonized by riparian vegetation.

Scores for all but one of the functional capacity indices improved in the Dumontier WAA from the baseline assessment. Scores for the functions of surface groundwater storage and flow, generation and export of organic carbon, characteristic aquatic invertebrate habitats, and floodplain interspersions and connectivity increased the most in the Dumontier WAA. The restoration project in the upstream Demonstration Reach WAA improved ratings for the frequency of surface and subsurface flooding frequency (Vsurf and Vsubfreq), proportionality of landscape features (Vcomplex), geomorphic modifications (Vgeomod), and macrotopographic complexity (Vmacro) throughout the larger landscape assessment area that includes the Dumontier WAA, positively impacting scores for nearly all of the

functional capacity indices. The improved score for tree density (Vdtree) in the Dumontier WAA positively affected the score for generation and export of organic carbon associated related to increased carbon inputs to the system from the trees. The score for characteristic plant community declined from the baseline, largely due to the decrease in the score for percent cover by native plants (Vnpcov).

*Demonstration Reach – Jocko River main stem, LAA 7*

The Demonstration Reach WAA received an HGM score of 6.96 in 2018, resulting in 113.03 mitigation credits. The WAA includes portions of Leases 5807 and 5757 that were evaluated separately for their baseline assessments in 2003, receiving scores of 5.83 and 5.81, respectively.

The Demonstration Reach was the subject of a two-phase stream and floodplain restoration project during 2004 and 2008. The project removed levees and raised the channel bed elevation to restore a meandering channel pattern and increase the river's connectivity with the floodplain.

As a result of the restoration project and subsequent management of the WAA for conservation purposes, all of the former grazing and agricultural land (cover type) were reclassified as riparian vegetation cover types for the 2018 assessment. Much of the former grazing and agricultural lands on the south side of the Jocko River were classified as developing shrub communities (cover type 5). In the south floodplain planted trees and shrubs along with natural recruitment of cottonwoods, willows, and other shrubs are contributing to the woody vegetation cover. Much of the former grazing and agricultural lands on the north side of the Jocko River were classified as conifer forest communities (cover type 1). Portions of the northern floodplain are on a terrace that is higher than the currently active floodplain. Historic logging removed trees from the northern floodplain, resulting in only scattered, mature conifers and cottonwoods being present at the current time. Within the active floodplain of the Jocko River, diverse assemblies of riparian cover types with multiple age classes of trees and shrubs are now present, indicating that natural processes of sediment transport, formation of depositional surfaces, and natural colonization of riparian vegetation is occurring.

Scores for most wetland-scale variables increased within the Demonstration Reach WAA. The score for land use improved the most, from an average of 0.47 to 0.99, with elimination of grazing and agricultural uses in the floodplain and managing the lands for conservation and habitat. Similarly, the score for decomposition of organic matter (Vorgdecomp) in the soil increased from an average of 0.59 to 0.98 in association with a larger proportion of the floodplain being classified as native riparian vegetation communities versus grazing or livestock lands. Agricultural lands (cover type 10) receive an automatic rating of 0.1 on a scale of 0 to 1 for Vorgdecomp according to the HGM Assessment Method. Soils in many areas that were formerly mapped as cover type 10 include relatively deep mineral soil layers, with dark color values, indicating the presence of decomposing organic matter and reclassifying these areas to native riparian vegetation cover types allowed for them to be scored based these characteristics.

The score for tree density (Vdtree) decreased from an average of 0.60 to 0.40 in the Demonstration Reach WAA because newly restored floodplain areas with developing and re-establishing trees and shrubs were included in the tree-dominated cover types. Within preserved riparian forest and shrub communities, tree density and shrub cover likely remained similar to the baseline condition. The score for shrub cover (Vshrub) increased from an average of 0.86 to 0.92 in 2018, likely due to improved shrub cover in the restored floodplain. The score for herbaceous cover (Vherb) increased and all riparian cover types from an average of 0.74 to receiving the highest rating of 1.0 in 2018. The score for native plant



cover (Vnpcov) was 0.69, remaining similar to the average baseline score of 0.66. The score for large wood debris (Vlwd) increased from 0 to 0.3 in association with an increase in the area of exposed alluvial bar features (cover type7) and the presence of woody debris on these features in 2018.

Scores for all of the functional capacity indices increased within the Demonstration Reach WAA in 2018 compared to the baseline assessments. The score for nutrient cycling improved the most, from an average of 0.65 to 0.85, primarily due to the improved score for decomposition of organic matter. Two indices, surface-groundwater storage and flow and characteristic aquatic invertebrate habitats were the second most improved functions, both of which are scored based on landscape variable subindex scores. The score for surface-groundwater storage and flow increased from an average of 0.79 to 0.96 and the score for characteristic aquatic invertebrate habitats increased from an average of 0.76 to 0.93 in 2018. The restoration project improved ratings for surface and subsurface flooding frequency (VsurfREQ and VsubREQ), proportionality of landscape features (Vcomplex), geomorphic modifications (Vgeomod), and macrotopographic complexity (Vmacro) throughout the larger landscape assessment area that includes the Demonstration Reach, positively impacting scores for nearly all of the functional capacity indices. The area of cover type 10 in LAA 7 decrease by 94 acres in 2018, of which 72 acres of cover type 10 decrease occurred in the Demonstration Reach WAA. The Demonstration Reach restoration project improved riparian and wetland function not only in the WAA where work occurred, but these changes had a beneficial effect throughout this reach of the river.

#### *Nicholson – North Valley Creek*

The North Valley Creek WAA is nearly 24 acres and received an HGM score of 5.02 in 2018. This parcel did not meet the threshold HGM score of 5.39 required to receive mitigation credits in 2018. The baseline HGM score for the North Valley Creek parcel in 2005 was 5.09.

North Valley Creek is a tributary to Valley Creek which flows into the Jocko River in LAA 4. Within the North Valley Creek WAA, alder and other shrub species dominated the riparian vegetation community along the stream. Areas of saturated and shallowly inundated emergent wetlands are present in the upstream and middle portions of the WAA, particularly on the west side of the floodplain. The east floodplain in the downstream (south) portion of the WAA is slightly higher than the channel and is dominated by drier grasses and forbs; noxious weeds are also more common on this surface. Livestock grazing occurred prior to acquisition and if fences are damaged during runoff, livestock in adjacent pastures trespass into the WAA. The CSKT inspects and repairs fences to prevent this trespass access from occurring. The size of the WAA changed from the baseline to remove the center portion of the WAA that includes a higher terrace where a house and outbuilding had been present. The outbuilding burned down and only a foundation is left. The southwest boundary of the LAA/WAA was also revised to exclude the conifer-dominated slope that was determined to be outside of the floodplain functional extents.

Scores for all landscape variables remained the same as the baseline HGM Assessment.

In 2018, the overall HGM score decreased from the baseline largely due to the loss of forested vegetation cover that was mapped on the hillside for the baseline assessment and corresponding decrease in the score for tree cover. In 2018, wetland variable scores were 0.99 to 1.0 for land use (Vlanduse), decomposition of organic matter in the soil (Vorgdecomp), shrub cover (Vshrub), and herbaceous cover (Vherb). This was an increase of approximately 0.5 for Vlanduse, Vorgdecomp, and Vshrub. The score for tree density (Vdtree) decreased from 0.5 to 0 due to the loss of the conifer forest



that was determined to be outside the floodplain extents. The score for large wood debris (Vlwd) remained at 0 because exposed alluvial surfaces (cover type 7) are not present in the WAA/LAA. The score for native plant cover (Vnpcov) decreased from 0.93 to 0.51, due to the dense cover of introduced and noxious weed species in the drier herbaceous vegetation community in the southeast portion of the parcel. All shrub species are native in the WAA, and within emergent wetlands, native species including sedges and bulrush are the dominant species.

While the overall HGM score declined in the Nicholson North Valley Creek WAA, the score for nutrient cycling increased from 0.44 to 0.58 due to improved scores for shrub cover and decomposition of organic matter in the soil. The score for characteristic plant community decreased the most from 0.74 to 0.54 due to loss of tree-dominated cover types in the WAA and the low score for native plant cover. The highest scoring functions were generation and export of organic carbon (0.75) and characteristic aquatic invertebrate habitats (0.73), influenced by high scores for the variables of frequency of surface flooding, macrotopographic complexity, and shrub cover.

#### *McLeod Allotment – Mission Creek*

The McLeod Allotment WAA is 71.60 acres and received an HGM score of 6.0 in 2018, resulting in 71.60 mitigation credits for each acre of the WAA. The McLeod Allotment was acquired by CSKT after 2007 and 2018 was the first HGM Assessment of the site.

The parcel boundary represents both the LAA and WAA extent. The parcel includes the Mission Creek floodplain and channel. Mission Creek meanders throughout the WAA and several side channels are well connected to the main channel. Shrub-dominated communities predominate in the floodplain, that also includes cottonwood forest and a small area of riparian conifer forest. An herbaceous wetland is present north of the woody riparian vegetation community in what may be a historical channel trace of either Mission Creek or the Flathead River.

The McLeod LAA received relatively high scores for all landscape variables. The diverse and continuous woody riparian vegetation community in the floodplain contributes to a score of 0.8 for proportionality of landscape features (Vcomplex). The interspersions of side channels throughout much of the floodplain within the woody riparian zone contributes to the score of 0.7 for habitat connectivity (Vhabcon) and a scores of 0.8 for microtopographic complexity (Vmacro). The channel appears to be slightly incised in some areas where the streambanks are several feet above the river channel and old abutments from a bridge are present at the upstream end of LAA contributing to the score of 0.7 for geomorphic modification (Vgeomod). While the channel may be incised in some locations, overall frequency of surface (Vsurf) and subsurface (Vsub) flooding both received scores of 0.8 due to observations the main channel and side channels having access to portion of the floodplain during flood events, along with the observations of inundation and saturation due to groundwater influence in the floodplain.

The McLeod WAA received one of the lowest scores for land use (Vlanduse) of all the ARCO mitigation parcels. This was a recently acquired parcel and fencing updates are underway to exclude livestock access from adjacent pastures. Livestock access was most apparent on the north side of the Mission Creek channel, and the livestock do not appear to cross the stream to the south side of the river. Shrub cover (Vshrub) was the highest scoring wetland variable for the McLeod WAA (1.0). Tree density (Vdtr) scored 0.7 reflecting that the McLeod is primarily a shrub-dominated system. Herbaceous cover (Vherb) scored 0.77 because herbaceous cover was lower than the guidebook reference condition in forested and shrub communities. Native plant cover (Vnpcov) was scored as 0.56 due to low cover of

native plant species in the herbaceous layer of most cover types. Some golden willow (*Salix alba*) were observed, but not captured in the vegetation data; all other tree and shrub species are native. Introduced grasses are common in the herbaceous communities (cover type 6) and introduced forbs are common with reed canarygrass (*Phalaris arundinacea*) in the understory of cottonwood and shrub communities (cover types 2 and 5).

The large wood debris variable received a score of zero due to the relatively small area, 0.14 acres, of exposed depositional features and the lack of any large wood debris on these surfaces.

Nutrient cycling was the highest scoring function (0.82) for the McLeod WAA due to the diverse vegetation community that includes multiple strata of vegetation, and soil conditions that reflect active decomposition of organic matter throughout the WAA. The interspersed side channels and evidence of surface and groundwater connections combined with the vegetation community contribute to high scores all of the other functions scored by the HGM Assessment.

#### Office-Based Assessment Findings

For all the office-based assessments, wetland and riparian functions were estimated to have improved due to changes in land management that removed grazing and haying in the WAAs. The management changes were expected to have improved scores for land use (Vlanduse) at all the WAAs. Scores for decomposition of organic matter (Vorgdecomp) were also expected to have improved at all WAAs because soils in the former agricultural lands would now be examined to measure indicators of organic matter decomposition rather than receiving a default score of 0.1. Based on data collected in other WAAs in 2018, most of the vegetation cover types scored well for decomposition of organic and similar score increases were applied for the office-based assessments.

All of the WAAs assessed in the office were visited in 2017 to verify cover type mapping updates and notes were made regarding the vegetation communities, particularly any major changes since the baseline assessments. Generally, vegetation scores for office-based HGM Assessments were not changed from the baseline. Passive management strategies have occurred at the 2018 office-based HGM Assessment sites, including maintenance to install and repair fences, weed control, and allowing natural processes to occur. Therefore, tree density (Vdtree) and shrub cover (Vshrub) were not expected to have changed much since the baseline assessment. Herbaceous cover (Vherb) was improved in some locations where removal of grazing is expected to have resulted in an increase in herbaceous vegetation cover. Based on observations of introduced and/or noxious weed species abundance during site visits, scores for native plant cover (Vnpcov) were adjusted. Most tree and shrub species observed in the WAAs are native, but the cover of native species in the herbaceous layer varies depending on specific conditions in the WAAs.

The following sections provide brief descriptions of landscape variable score updates for office-based assessments as well key assumptions that were made to justify scores assigned for wetland variables at each WAA that was assessed in the office.

#### *Jocko River main stem, LAA 2*

Five of the ARCO Mitigation parcels that were evaluated using an office-based HGM Assessment are located in LAA 2 of the main stem Jocko River. In LAA 2, proportionality of landscape features (Vcomplex) was the only landscape variable score to change due to the conversion of approximately 278 acres from pasture and farmland to riparian vegetation cover types in the Jocko River floodplain (total

area of LAA 2 is 1.476 acres). Land management for conservation and habitat value and passive restoration is the main strategy for ARCO parcels in LAA 2. Berms and levees confine the Jocko River to the north side of the floodplain through much of LAA 2, so while natural processes are allowed to function, natural recovery of the woody vegetation in the larger floodplain will be slow without the natural disturbance processes to create new floodplain surfaces where vegetation can colonize and establish. Therefore, much of the former farmland was reclassified as herbaceous vegetation rather than a mix of other riparian vegetation cover types, limiting the increase in score for Vcomplex from 0.4 to 0.5, an improvement of 0.1 points.

Estimated scores for wetland variables and functional capacity indices for the five office-based HGM Assessments in LAA 2 are described below. Field data from other similar ARCO mitigation parcels in the Jocko River main stem were used as a reference to select appropriate scores for the wetland variables.

#### [Lease 4515](#)

Lease 4515 WAA is approximately 73 acres and is estimated to have an HGM score of 5.37 in 2018, which would not qualify for mitigation credits. The baseline HGM Assessment score was 5.17 in 2003.

During a 2017 site visit, the existing woody riparian vegetation conditions in Lease 4515 remained similar to the baseline condition. In the former agricultural land in the north floodplain, wetland vegetation, including some young shrubs, was establishing in lower elevation swales. Noxious weeds were present, mixed with native wetland vegetation in the swales. The score for herbaceous cover was raised from 0.67 to 0.79 to reflect the expectation that herbaceous cover increased in shrub vegetation communities (cover type 5) with land management changes. Scores for tree density (Vdtree), shrub cover (Vshrub), and native plant cover (Vnpcov) remained similar to the baseline scores.

Nutrient cycling is estimated to be the most improved function, increasing from 0.59 to 0.74, in the Lease 4515 WAA due primarily to the improved scores for proportionality of landscape feature (Vcomplex) and decomposition of organic matter (Vorgdecomp) associated changing land management and reclassify former agricultural lands as riparian vegetation cover types.

#### [Bison Range Reach](#)

The Bison Range Reach WAA is approximately 142 acres and is estimated to have an HGM score of 5.45 in 2018, which would qualify for mitigation credits, pending verification of the score with field data. Lease 4513 was the main Bison Range Reach parcel at the baseline HGM Assessment in 2003, receiving a score of 4.87. Additional parcels acquired by the ARCO mitigation program were added to the Bison Range Reach WAA for the 2018 office-based HGM Assessment.

During a 2017 site visit, the existing woody riparian vegetation conditions in the Bison Range Reach remained similar to the baseline condition; however, willows and other wetland shrubs are expanding into wet areas in former hay fields near the downstream end of the parcel. In other lower elevation swales throughout the southern floodplain in former hay fields, wetland vegetation, including some young shrubs is also establishing. Noxious weeds were present mixed with native wetland vegetation in the swales. The score for tree density was raised from 0.9 to 1.0 with the expectation that some younger age class trees are maturing to a size where they would count for tree density. Shrub communities are expanding in the floodplain, and the score for shrub cover (Vshrub) remained at 1.0. The score for herbaceous cover (Vherb) was raised from 0.68 to 0.91 to reflect the expectation that herbaceous cover increased in cottonwood forest (cover type 2), pole cottonwood (cover type 3) and

colonizing depositional surfaces (cover type 4) with land management changes. The score for native plant cover (Vnpcov) increased slightly from 0.74 to 0.75 to reflect the presence of noxious weeds in the herbaceous wetland swales in the floodplain, but also the assumption that native plant cover may have improved slightly in other tree- and shrub-dominated riparian vegetation cover types.

Nutrient cycling is estimated to be the most improved function, increasing from 0.54 to 0.78, in the Bison Range Reach WAA due primarily to the improved scores for proportionality of landscape feature (Vcomplex) and decomposition of organic matter (Vorgdecomp) associated with changing land management and reclassifying former agricultural lands as riparian vegetation cover types.

#### [Cole – Jocko River main stem, LAA 2](#)

The Cole WAA includes multiple parcels along the Jocko River in LAA 2. The CSKT holds conservation easements for the riparian forest buffer portions of these parcels to prevent these areas from being developed. However, farming is still allowed within the fields adjacent to the riparian buffer. Because it is expected that the ongoing farming land use would result in an HGM score that would not qualify for mitigation credits, these parcels were not evaluated in the office.

#### [Eggert – Jocko River main stem, LAA 2](#)

The Eggert parcel is 0.4 acres in size and was a former inholding near the Bison Range Reach WAA. After acquisition, buildings in the Eggert WAA were removed. The Eggert WAA contributes to the overall conservation efforts in Jocko River main stem; however, an office-based HGM Assessment was not completed for this site because its small size doesn't accurately capture floodplain function in the area.

#### [Stranahan – Jocko River main stem, LAA 2](#)

The Stranahan WAA is approximately 53 acres and is estimated to have an HGM score of 5.32 in 2018, which would not qualify for mitigation credits. The baseline HGM Assessment score was 4.65 in 2003.

During a 2017 site visit, the existing woody riparian vegetation conditions in the Stranahan WAA remained similar to the baseline condition; however, dense rose and snowberry understory vegetation that recolonized after removing grazing from the site may be decreasing slightly, allowing for more herbaceous vegetation to establish in the understory of cottonwood forest and shrub communities (cover types 2 and 5). While shrub cover may be decreasing slightly in some areas, it is becoming more reflective of the reference conditions and the score for shrub cover (Vshrub) remained similar to the baseline score. Experimental planting plots were located in the south floodplain and some trees and shrubs from these plantings are surviving, with some planted cottonwoods reaching tree size (taller than 6 meters) after their installation in the early 2000s. The score for tree density (Vdtree) was increased to reflect the maturation of trees in the planting areas and also within the existing cottonwood forest areas (cover type 2). The score for native plant cover (Vnpcov) remained similar to the baseline, decreasing from 0.89 to 0.87, as there appeared to be little change in the amount of introduced grasses or noxious weeds in the herbaceous vegetation community throughout the WAA. The score for large wood debris (Vlwd) is expected to have improved from the baseline condition, increasing from 0 to 0.40. Since the baseline HGM Assessment, exposed depositional features have developed in the channel and it is suspected that large wood is being recruited to these surfaces during flood events.

Nutrient cycling is estimated to be the most improved function in the Bison Range Reach, increasing from 0.50 to 0.72, due primarily to the improved scores for proportionality of landscape feature (Vcomplex) and decomposition of organic matter (Vorgdecomp) associated with changing land management



and reclassify former agricultural lands as riparian vegetation cover types. Scores for the function of generation and export of carbon and characteristic plant community are also expected to have improved due to increased tree density in the WAA.

*Clinkenbeard – Jocko River main stem, LAA 5*

The Clinkenbeard WAA is approximately 57 acres and is estimated to have an HGM score of 5.39 in 2018, which would qualify for mitigation credits. The baseline HGM Assessment score was 4.68 in 2004.

The Clinkenbeard WAA occurs in LAA 5, where the Hatier and Lease 5022 WAAs which were evaluated in the field in 2018, are also present. Details of landscape variable changes for LAA 5 are discussed above in section ‘Landscape Assessment Area Variable Updates’.

During a 2017 site visit, the existing woody riparian vegetation conditions in the Clinkenbeard WAA remained similar to the baseline condition; however, some trees and shrubs are establishing from 2006 plantings in the floodplain on the north side of the river and along a restored streambank. Planted trees along with maturation of existing trees is expected to have increased tree density (Vdtree), raising the estimated score to 0.6 from 0.16. Overall shrub cover (Vshrub) is expected to be similar to the baseline condition, decreasing slightly from 0.80 to 0.77. Herbaceous cover is estimated to have increased from 0.71 to 0.91 with removal of grazing in cottonwood communities (cover types 2, 3, and 4) and shrub communities (cover type 5). The score for native plant cover (Vnpcov) is estimated to have decreased from 0.72 to 0.42, primarily due to the increased area of cover types 6 that includes former pasture areas in the northern portion of the parcel that proportionally weights the overall score for the WAA rather than an actual decrease in the cover of native plant species. The score for large wood debris is expected to be similar to the baseline condition.

Nutrient cycling is estimated to be the most improved function in the Bison Range Reach, increasing 0.41 to 0.72, due primarily to the improved scores for proportionality of landscape feature (Vcomplex) and decomposition of organic matter (Vorgdecomp) associated with changing land management and reclassifying former agricultural lands as riparian vegetation cover types. Scores for the function of generation and floodplain interspersed and connection are also expected to have improved due to increased tree density in the WAA as well as improved scores for landscape variables of proportionality of landscape features (Vcomplex), floodplain habitat connectivity (Vhabcon), and frequency of surface flooding (Vsurfreg).

*Lease 5768 – North Fork Jocko River*

The North Fork Jocko River WAA, Lease 5768, is approximately 36 acres and is estimated to have an HGM score of 5.70 in 2018, which would qualify for mitigation credits. The baseline HGM Assessment score was 5.08 in 2003.

The Lease 5768 parcel boundary defines both the LAA and WAA extents for the HGM Assessment. The landscape variable of proportionality of floodplain features (Vcomplex) is estimated to have improved as updated mapping reflects that a matrix of both mature conifer and cottonwood vegetation communities are present in the floodplain rather than just conifer-dominated communities. With removal of livestock grazing and allowing the river channel to migrate and adjust in the floodplain, it is suspected that the frequency of subsurface flooding (Vsubfreq) has improved, increased the score from 0.1 to 0.2. The score for geomorphic modifications was increased from 0.25 to 0.3 to reflect the loss of trampling impacts along the stream from livestock use as well the removal of some fences near the channel that

accumulated debris during flooding, altering flows. The score for macrotopographic complexity (Vmacro) was increased from 0.75 to 0.80 to reflect that seasonal side channels are present in the floodplain and management for natural processes is allowing these side channels to move more freely through the floodplain.

Similar to the Jocko River main stem assessment areas, land management changes have the largest influence on functions in the North Fork Jocko River WAA. No farming lands were present at the baseline assessment and the entire parcel was part of a grazing allotment. Removing grazing from the site is estimated to have improved the score for land use (Vlanduse) from 0.34 to 1.0. The score for herbaceous cover (Vherb) is also expected to have improved from 0.61 to 1.0 with the removal grazing. During a 2017 site visit, conifer seedling recruitment was observed in the floodplain and with the removal of grazing, the cover trees and shrub species may increase; however, scores for tree density (Vdtree) and shrub cover (Vshrub) were not significantly changed for the 2018 office-based assessment. All tree and shrub species are native and the abundance of native species in the herbaceous layer of vegetation communities appears to be similar to the baseline conditions, so the score for native plant cover (Vnpcov) remained similar to the baseline condition, increasing from 0.72 to 0.75. The score for large wood debris (Vlwd) decreased slightly from 0.55 to 0.50; the area of exposed depositional surfaces (cover type 7) decreased slightly, but sediment transport processes are functioning in the WAA and large wood debris is present in the system.

The scores for all the HGM Assessment functions are estimated to have increased slightly in the North Fork Jocko River WAA, with the largest increase estimated for floodplain interspersion and connection (increase from 0.47 to 0.57), due to the improved scores for land use, proportionality of landscape features, and macrotopographic complexity. The highest scoring function in Lease 5768 is estimated to be generation and export of organic carbon (0.90), due to the high cover of trees, shrubs, and herbaceous vegetation that contribute organic carbon and the frequency of surface flooding that is able to distribute this material throughout the floodplain during flood events.

#### *Jefferson Parcel – Jocko Spring Creek*

The Jefferson Parcel WAA is approximately 45 acres and is estimated to have an HGM score of 5.21 in 2018, which would not qualify for mitigation credits. The baseline HGM Assessment score was 4.65 in 2007.

Jocko Spring Creek flows into the Jocko River in LAA 4, and while the Jefferson WAA is located upstream and slightly outside of the Jocko River ecological floodplain, the scores for landscape variables in LAA 4 of the Jocko River main stem were used for the Jefferson LAA because similar conditions exist in this area. The baseline assessment also made the same assumptions regarding landscape variable scores. Details of landscape variable changes for LAA 4 are discussed above in section 'Landscape Assessment Area Variable Updates'.

Removal of grazing and management for natural processes improved the score for land use (Vlanduse) in the Jefferson WAA from 0.47 to 1.0. The conversion of 36 acres of former pasture to riparian vegetation communities also contributed to an estimated increase in the score for decomposition of organic matter (Vorgdecomp) from 0.22 to 0.98. Trees are not present in the WAA and the score for tree density (Vdtree) remains at 0. The removal of grazing is expected to support the recovery and expansion of shrubs along the Jocko Spring Creek channel, improving the estimated score for shrub cover (Vshrub) from 0.35 to 0.60. Herbaceous cover (Vherb) was rated highly for the baseline

assessment (1.0) and remained high during a 2017 site visit based on visual observations; however, it appears that the removal of grazing resulted in a flush of introduced and noxious weeds that were likely present in the soil seed bank. Shallow groundwater and inundation are common in the floodplain making access and treatment options for weed control difficult. This resulted in a lower estimated score for native plant cover (Vnpcov) from 1.0 to 0.23. Exposed depositional surfaces are not present in the spring creek, nor is large wood debris, resulting in a score of 0 for large wood debris (Vlwd).

Nutrient cycling is estimated to be the most improved function in the Bison Range Reach, increasing from 0.34 to 0.64 due primarily to the improved scores for proportionality of landscape feature (Vcomplex) and decomposition of organic matter (Vorgdecomp) associated changing land management and reclassify former agricultural lands as riparian vegetation cover types. Scores for surface groundwater storage and flow, characteristic aquatic invertebrate habitats, and floodplain interspersed and connectivity improved, largely due to improvement in landscape scale scores for the diversity and distribution of riparian vegetation cover types in the floodplain as well as surface and subsurface flooding. The score for characteristic plant community decreased from 0.66 to 0.35 due to the presence of noxious weeds in the floodplain.

#### *Finley Creek*

Three ARCO Mitigation parcels that were evaluated using an office-based HGM Assessment are located in the Finley Creek floodplain south of Arlee, Montana. Throughout much of the Finley Creek WAA, the stream channel has a narrow riparian corridor with tree or shrub-dominated communities, but the wider floodplain located on an alluvial fan includes groundwater upwelling and springs that support expansive floodplain wetlands.

The complex of all the ARCO mitigation parcels along Finley Creek was considered the LAA for the 2018 office-based HGM Assessment. The score for proportionality of landscape features (Vcomplex) changed due to the conversion of approximately 280 acres from pasture and farmland (cover type 10) to riparian vegetation cover types in the Finley Creek floodplain. Land management for ARCO parcels is now focused on conservation and habitat value. Multiple restoration projects occurred within the Finley Creek LAA to plug ditches and regrade an irrigation pond to improve hydrologic conditions in the reach; restore the Finley Creek channel and streambanks; and restore Agency Creek, a tributary to Finley Creek. The score for frequency of subsurface flooding (Vsubfreq) improved from 0.1 to 0.4 with the restoration work to plug ditches restore groundwater hydrology in the LAA. The restoration work also removed some geomorphic modification and improved the score for Vgeomod from 0.25 to 0.5. The score for frequency of surface flooding (Vsurf) also improved from 0.1 to 0.2 due to the restoration work. The interspersed water throughout the floodplain is expected to have improved the score for macrotopographic complexity (Vmacro) from 0.4 to 0.8 as well as the score for habitat connectivity (Vhabcon) from 0.4 to 0.5.

For all the Finley Creek WAAs, estimated scores for land use (Vlanduse) were increased to reflect the change in management from grazing to management for natural processes and habitat. The conversion of nearly all former pasture and farmland to riparian vegetation cover types allowed soils to be assessed and factored into the score decomposition of organic matter in the soil (Vorgdecomp). Agricultural lands receive an automatic score 0.1 on a scale of 0 to 1 for decomposition of organic matter according to the HGM Assessment Method; because these areas were reclassified, the depth and color of the soil can be evaluated and it is expected that deep mineral soils that contain organic matter are present in the

floodplain. Estimated scores for other wetland variables and functional capacity indices for the three office-based HGM Assessments in the Finley Creek LAA are described below. Field data from other similar ARCO mitigation parcels were used as a reference to select appropriate scores for the wetland variables.

#### [North Parcel](#)

The North Parcel WAA along Finley Creek is approximately 283 acres and is estimated to have an HGM score of 4.85 in 2018, which would not qualify for mitigation credits. The 2004 revised baseline HGM Assessment score was 2.98 that included an additional parcel in the northeast corner of the North WAA.

Most of the restoration work in the Finley Creek LAA occurred in the North Parcel WAA. A large herbaceous wetland area that is perennially saturated or shallowly inundated is present west of Finley Creek in the floodplain. Tree density (Vdtree) and shrub cover (Vshrub) is estimated to be the same as the baseline condition, receiving high scores of 0.95 and 0.80, respectively. Herbaceous cover (Vherb) is expected to have improved from 0.89 to 1.0 with the removal of grazing. Few, scattered weeds were observed in the North Parcel during a 2017 site visit and the score for native plant cover is expected to have increased slightly from 0.76 to 0.81. Large wood debris (Vlwd) continues to receive a score of zero because exposed depositional surfaces are not present in the system.

All of the functional capacity index scores are estimated to have increased in 2018, largely due to the improvement in landscape variable scores related to converting farmlands to riparian vegetation cover types and improving hydrologic conditions throughout the LAA. In the North WAA, characteristic plant community is estimated to be the highest scoring function (0.81), due to the high cover of trees, shrubs, and herbaceous cover, mostly consisting of native species.

#### [Leases 5029 and 5030](#)

The WAA consisting of Leases 5029 and 5030 along Finley Creek is approximately 48 acres and is estimated to have an HGM score of 4.79 in 2018, which would not qualify for mitigation credits. The baseline HGM Assessment score was 3.12 in 2005.

Leases 5029 and 5030 encompass the active Finley Creek floodplain where cottonwood forest communities (cover type 2) comprise more than half of the total WAA area. In these communities, tree density (Vdtree) and shrub cover (Vshrub) are estimated to be high, 1.0 and 0.96 respectively, matching the baseline condition. Herbaceous cover (Vherb) is estimated to have improved slightly from 0.95 to 1.0 with the removal of grazing. Noxious weed species are slightly more common in the Lease 5029 and 5030 WAA, resulting a lower score of 0.58 from 0.64 for native plant cover (Vnpcov). Similar to the North Parcel, large wood debris (Vlwd) continues to receive a score of zero because exposed depositional surfaces are not present in the system.

Scores for all functional capacity indices are expected to have improved, except for characteristic plant community, which remained the same as the baseline. Nutrient cycling is estimated to be the highest scoring function (0.79) in Leases 5029 and 5030, due to the continued high vegetation cover and the improvement in landscape scale variable scores. Scores for characteristic aquatic invertebrate habitats and floodplain interspersions and connectivity are estimated to have improved the most from the baseline condition, largely due to landscape scale improvements. The score for characteristic aquatic invertebrate habitats is estimated to have increased from 0.20 to 0.48. The score for floodplain interspersions and connectivity is estimated to have increased from 0.27 to 0.54.



### Burlington Northern

The Burlington Northern WAA along Finley Creek is approximately 20 acres and is estimated to have an HGM score of 4.69 in 2018, which would not qualify for mitigation credits. This was the first assessment of the recently acquired Burlington Northern WAA located downstream (north of the North Parcel) on Finley Creek.

The WAA includes a short reach of the Finley Creek channel and the riparian forest adjacent to the channel. The north and south extents of the WAA include grass-dominated communities that are now being managed for natural processes and habitat values along with the intact riparian forest.

Land use (Vlanduse) and decomposition of organic matter (Vorgdecomp) are expected to be similar to other Finley Creek parcels and both wetland variables received estimated scores of 0.99. Tree density (Vdtree), shrub cover (Vshrub), and herbaceous cover (Vherb) are all expected to be similar to the conditions the Lease 5029 and 5030 WAA which also includes the active floodplain for Finley Creek, and these variables received scores for 0.9, 1.0, and 0.96 respectively. During a 2017 site visit, all tree species were noted to be native, but the invasive species common buckthorn (*Rhamnus cathartica*), was observed in the shrub layer. Introduced and noxious weed species in the herbaceous layer were most common at the edges of the riparian forest and combined with the invasive shrub, native plant cover (Vnpcov) received an estimated score of 0.49. Similar to the other Finley Creek WAAs, large wood debris (Vlwd) received a score of zero because exposed depositional surfaces are not present in the system.

Nutrient cycling is estimated to be the highest scoring function (0.78) in the Burlington Northern WAA, due to the high vegetation cover and the improvement in landscape scale variable scores for the LAA as whole. The functions of generation and export of organic carbon, characteristic vertebrate habitats, and characteristic plant community received the second highest estimated scores of 0.69, 0.65, and 0.64, respectively, due to high vegetation cover in the WAA. Landscape variables for the proportion and distribution of cover types in the greater LAA, along with the frequency of flooding also contribute these variables that scored well in the Burlington Northern WAA.

## Conclusions

The CSKT have been able to protect 1,759 acres along the main stem Jocko River, its tributaries and Mission Creek through the ARCO mitigation program. At least 826 acres of these ARCO mitigation parcels received HGM Assessment scores of at least 5.39, meeting or exceeding the threshold score to qualify for mitigation credits according the Consent Decree.

Through both active and passive restoration measures, the CSKT have improved riparian and wetland functions. Active restoration has resulted in more rapid improvements to aquatic and terrestrial habitat conditions and set the stage for allowing natural processes to continue and maintain these functions. Passive restoration actions have removed impediments to functional process and set the stage for long-term recovery.

The CSKT will continue to manage the ARCO mitigation parcels in perpetuity for the benefit of conservation and habitat values. Additional restoration work may occur in the future following strategies in the Jocko River Master Plan. ARCO mitigation parcels showed improvements in wetland and riparian functions since acquisition and this trend is expected to continue, with most if not all parcels achieving the threshold score at some point in the future.

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## Appendix A. HGM Assessment Data

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### Landscape Assessment Area Data

Table A-1. Summary of HGM cover type mapping areas (acres) within Jocko River LAAs, comparing 2018 mapping and baseline mapping.

Table A-2. Summary of HGM cover type mapping areas (acres) within LAAs located in the North Fork Jocko River, North Valley Creek, Jocko Spring Creek, Finley Creek, and Mission Creek, comparing 2018 mapping and baseline mapping.

Table A- 3. Summary of Landscape Assessment Area variable subindex scores for LAAs in the Jocko River main stem, comparing 2018 and baseline ratings.

Table A- 4. Summary of Landscape Assessment Area variable subindex scores for LAAs in Jocko River tributaries and Mission Creek, comparing 2018 and baseline ratings.

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## Hydrogeomorphic Functional Assessment of ARCO Wetland and Riparian Mitigation Lands

Table A- 1. Summary of HGM cover type mapping areas (acres) within Jocko River LAAs, comparing 2018 mapping and baseline mapping.

LAA (JRMP Reach)		HGM Cover Type											
		1	2	3	4	5	6	7	8	9	10	11	Total
<b>LAA 1 (Reaches 1 and 2)</b>	Acres - 2018	16.16	54.37	12.25	6.43	46.37	33.16	2.01	14.63	7.14	67.63	92.99	<b>353.14</b>
	Percent of EFP - 2018	4.58%	15.40%	3.47%	1.82%	13.13%	9.39%	0.57%	4.14%	2.02%	19.15%	26.33%	<b>100.00%</b>
	<i>Change baseline to 2018</i>	<i>-1.78</i>	<i>-0.81</i>	<i>+10.74</i>	<i>-7.86</i>	<i>+19.68</i>	<i>+23.59</i>	<i>+1.48</i>	<i>+7.76</i>	<i>+0.96</i>	<i>+1.45</i>	<i>+68.00</i>	<i><b>+123.21</b></i>
	Acres - baseline <sup>1</sup>	17.94	55.18	1.51	14.29	26.69	9.57	0.53	6.87	6.18	66.18	24.99	<b>229.93</b>
	Percent of EFP - baseline	7.80%	24.00%	0.66%	6.21%	11.61%	4.16%	0.23%	2.99%	2.69%	28.78%	10.87%	<b>100.00%</b>
<b>LAA 2 (Reach 3)</b>	Acres - 2018	15.54	209.47	7.90	3.44	106.15	288.90	0.76	53.06	10.33	620.77	159.94	<b>1476.26</b>
	Percent of EFP - 2018	1.05%	14.19%	0.54%	0.23%	7.19%	19.57%	0.05%	3.59%	0.70%	42.05%	10.83%	<b>100.00%</b>
	<i>Change baseline to 2018</i>	<i>+2.27</i>	<i>+1.20</i>	<i>+5.88</i>	<i>-10.12</i>	<i>+44.45</i>	<i>+255.68</i>	<i>+0.74</i>	<i>+5.37</i>	<i>-1.02</i>	<i>-278.37</i>	<i>+13.44</i>	<i><b>+39.52</b></i>
	Acres - baseline <sup>1</sup>	13.27	208.27	2.02	13.56	61.70	33.22	0.02	47.69	11.35	899.14	146.50	<b>1436.74</b>
	Percent of EFP - baseline	0.92%	14.50%	0.14%	0.94%	4.29%	2.31%	0.00%	3.32%	0.79%	62.58%	10.20%	<b>100.00%</b>
<b>LAA 3 (Reach 4)</b>	Acres - 2018	2.26	67.67	0.10	0.32	31.88	13.59	0.06	20.22	9.42	43.65	81.44	<b>270.61</b>
	Percent of EFP - 2018	0.84%	25.01%	0.04%	0.12%	11.78%	5.02%	0.02%	7.47%	3.48%	16.13%	30.09%	<b>100.00%</b>
	<i>Change baseline to 2018</i>	<i>+2.26</i>	<i>+20.50</i>	<i>+0.10</i>	<i>-2.61</i>	<i>+8.21</i>	<i>+7.62</i>	<i>+0.03</i>	<i>+0.54</i>	<i>-0.02</i>	<i>-13.13</i>	<i>-10.62</i>	<i><b>+12.88</b></i>
	Acres - baseline <sup>2</sup>	0.00	47.17	0.00	2.93	23.67	5.97	0.03	19.68	9.44	56.78	92.06	<b>257.73</b>
	Percent of EFP - baseline	0.00%	18.30%	0.00%	1.14%	9.18%	2.32%	0.01%	7.64%	3.66%	22.03%	35.72%	<b>100.00%</b>
<b>LAA 4 (Reach 5)</b>	Acres - 2018	54.31	160.60	9.30	16.11	91.13	665.59	7.12	29.90	28.72	496.78	139.79	<b>1699.35</b>
	Percent of EFP - 2018	3.20%	9.45%	0.55%	0.95%	5.36%	39.17%	0.42%	1.76%	1.69%	29.23%	8.23%	<b>100.00%</b>
	<i>Change baseline to 2018</i>	<i>+6.15</i>	<i>+2.91</i>	<i>+4.36</i>	<i>-11.10</i>	<i>+23.57</i>	<i>+630.02</i>	<i>+6.53</i>	<i>+1.14</i>	<i>-4.87</i>	<i>-481.88</i>	<i>+3.98</i>	<i><b>+180.81</b></i>
	Acres - baseline <sup>2</sup>	48.16	157.69	4.94	27.21	67.56	35.57	0.59	28.76	33.59	978.66	135.81	<b>1518.54</b>
	Percent of EFP - baseline	3.17%	10.38%	0.33%	1.79%	4.45%	2.34%	0.04%	1.89%	2.21%	64.45%	8.94%	<b>100.00%</b>
<b>LAA 5 (Reach 6)</b>	Acres - 2018	62.38	91.98	1.92	5.49	32.38	92.21	1.29	17.78	3.13	68.75	6.06	<b>383.37</b>
	Percent of EFP - 2018	16.27%	23.99%	0.50%	1.43%	8.45%	24.05%	0.34%	4.64%	0.82%	17.93%	1.58%	<b>100.00%</b>
	<i>Change baseline to 2018</i>	<i>+40.73</i>	<i>+8.30</i>	<i>+1.54</i>	<i>-2.51</i>	<i>+19.29</i>	<i>+86.02</i>	<i>-0.38</i>	<i>+3.30</i>	<i>-0.69</i>	<i>-128.98</i>	<i>-28.15</i>	<i><b>-1.53</b></i>
	Acres - baseline <sup>2</sup>	21.65	83.68	0.38	8.00	13.09	6.19	1.67	14.48	3.82	197.73	34.21	<b>384.90</b>
	Percent of EFP - baseline	5.62%	21.74%	0.10%	2.08%	3.40%	1.61%	0.43%	3.76%	0.99%	51.37%	8.89%	<b>100.00%</b>
<b>LAA 6 (Reach 7)</b>	Acres - 2018	0.41	1.25	0.03	0.00	3.70	0.00	0.00	2.23	0.15	0.44	0.11	<b>8.32</b>
	Percent of EFP - 2018	4.93%	15.02%	0.36%	0.00%	44.47%	0.00%	0.00%	26.80%	1.80%	5.29%	1.32%	<b>100.00%</b>
	<i>Change baseline to 2018</i>	<i>-0.26</i>	<i>+1.25</i>	<i>+0.03</i>	<i>-0.04</i>	<i>+1.59</i>	<i>0.00</i>	<i>0.00</i>	<i>+0.12</i>	<i>+0.06</i>	<i>-0.20</i>	<i>-0.72</i>	<i><b>+1.83</b></i>
	Acres - baseline <sup>1</sup>	0.67	0.00	0.00	0.04	2.11	0.00	0.00	2.11	0.09	0.64	0.83	<b>6.49</b>
	Percent of EFP - baseline	10.32%	0.00%	0.00%	0.62%	32.51%	0.00%	0.00%	32.51%	1.39%	9.86%	12.79%	<b>100.00%</b>
<b>LAA 7 (Reach 8)</b>	Acres - 2018	132.71	91.40	3.45	5.79	69.03	4.35	0.74	17.86	3.74	16.90	13.91	<b>359.88</b>
	Percent of EFP - 2018	36.88%	25.40%	0.96%	1.61%	19.18%	1.21%	0.21%	4.96%	1.04%	4.70%	3.87%	<b>100.00%</b>
	<i>Change baseline to 2018</i>	<i>+61.06</i>	<i>-0.84</i>	<i>+3.45</i>	<i>-2.84</i>	<i>+38.00</i>	<i>-5.42</i>	<i>-1.76</i>	<i>+2.60</i>	<i>-0.99</i>	<i>-94.65</i>	<i>-5.30</i>	<i><b>-6.70</b></i>
	Acres - baseline <sup>2</sup>	71.32	92.24	0.00	8.63	31.37	9.77	2.50	15.26	4.73	111.55	19.21	<b>366.58</b>
	Percent of EFP - baseline	19.46%	25.16%	0.00%	2.35%	8.56%	2.67%	0.68%	4.16%	1.29%	30.43%	5.24%	<b>100.00%</b>

<sup>1</sup> Baseline acres are from the HGM Report (2005).

<sup>2</sup> Baseline acres are from the HGM Addendum (2006).

### Hydrogeomorphic Functional Assessment of ARCO Wetland and Riparian Mitigation Lands

Table A- 2. Summary of HGM cover type mapping areas (acres) within ARCO Parcels located in the Flathead Reservation, comparing 2018 mapping and baseline mapping

LAA (JRMP Reach)		HGM Cover Type											Total
		1	2	3	4	5	6	7	8	9	10	11	
North Fork Jocko River	Acres - 2018	23.22	8.51	0.00	0.41	0.00	0.00	0.54	3.12	0.00	0.00	0.00	35.80
	Percent of EFP - 2018	64.86%	23.77%	0.00%	1.15%	0.00%	0.00%	1.51%	8.72%	0.00%	0.00%	0.00%	100.00%
	<i>Change baseline to 2018</i>	<i>-10.24</i>	<i>+8.51</i>	<i>0.00</i>	<i>+0.41</i>	<i>0.00</i>	<i>-0.72</i>	<i>-1.00</i>	<i>1.54</i>	<i>-0.31</i>	<i>0.00</i>	<i>0.00</i>	<i>-1.81</i>
	Acres - baseline <sup>1</sup>	33.46	0.00	0.00	0.00	0.00	0.72	1.54	1.58	0.31	0.00	0.00	37.61
	Percent of EFP - baseline	88.97%	0.00%	0.00%	0.00%	0.00%	1.91%	4.09%	4.20%	0.82%	0.00%	0.00%	100.00%
North Valley Creek	Acres - 2018	0.00	0.00	0.00	0.00	16.96	6.68	0.00	0.00	0.00	0.00	0.31	23.95
	Percent of EFP - 2018	0.00%	0.00%	0.00%	0.00%	70.81%	27.89%	0.00%	0.00%	0.00%	0.00%	1.29%	100.00%
	<i>Change baseline to 2018</i>	<i>-0.44</i>	<i>0.00</i>	<i>0.00</i>	<i>0.00</i>	<i>-1.06</i>	<i>+4.35</i>	<i>0.00</i>	<i>-1.15</i>	<i>0.00</i>	<i>-36.75</i>	<i>-1.35</i>	<i>-36.40</i>
	Acres - baseline <sup>1</sup>	0.44	0.00	0.00	0.00	18.02	2.33	0.00	1.15	0.00	36.75	1.66	60.35
	Percent of EFP - baseline	0.73%	0.00%	0.00%	0.00%	29.86%	3.86%	0.00%	1.91%	0.00%	60.89%	2.75%	100.00%
Jocko Spring Creek	Acres - 2018	0.00	0.00	0.00	0.00	2.94	39.48	0.00	1.68	0.00	0.49	0.56	45.15
	Percent of EFP - 2018	0.00%	0.00%	0.00%	0.00%	6.51%	87.44%	0.00%	3.72%	0.00%	1.09%	1.24%	100.00%
	<i>Change baseline to 2018</i>	<i>0.00</i>	<i>0.00</i>	<i>0.00</i>	<i>0.00</i>	<i>+1.60</i>	<i>+35.17</i>	<i>0.00</i>	<i>-0.01</i>	<i>-0.05</i>	<i>-36.79</i>	<i>0.00</i>	<i>-0.08</i>
	Acres - baseline <sup>2</sup>	0.00	0.00	0.00	0.00	1.34	4.31	0.00	1.69	0.05	37.28	0.56	45.23
	Percent of EFP - baseline	0.00%	0.00%	0.00%	0.00%	2.96%	9.53%	0.00%	3.74%	0.11%	82.42%	1.24%	100.00%
Finley Creek	Acres - 2018	0.00	54.96	0.00	0.00	45.49	242.73	0.00	4.10	1.04	0.40	2.32	351.04
	Percent of EFP - 2018	0.00%	15.66%	0.00%	0.00%	12.96%	69.15%	0.00%	1.17%	0.30%	0.11%	0.66%	100.00%
	<i>Change baseline to 2018</i>	<i>-6.57</i>	<i>+33.72</i>	<i>0.00</i>	<i>0.00</i>	<i>+5.47</i>	<i>+205.43</i>	<i>0.00</i>	<i>+1.49</i>	<i>+0.87</i>	<i>-280.05</i>	<i>+1.72</i>	<i>-37.92</i>
	Acres - baseline <sup>2</sup>	6.57	21.24	0.00	0.00	40.02	37.30	0.00	2.61	0.17	280.45	0.60	388.96
	Percent of EFP - baseline	1.69%	5.46%	0.00%	0.00%	10.29%	9.59%	0.00%	0.67%	0.04%	72.10%	0.15%	100.00%
Mission Creek <sup>4</sup>	Acres - 2018	0.13	9.16	0.00	0.09	29.85	27.22	0.14	3.13	1.88	0.00	0.00	71.60
	Percent of EFP - 2018	0.18%	12.79%	0.00%	0.13%	41.69%	38.02%	0.20%	4.37%	2.63%	0.00%	0.00%	100.00%

<sup>1</sup> Baseline acres are from the HGM Report (2005).

<sup>2</sup> Baseline acres are from the HGM Addendum (2006).

<sup>3</sup> Baseline acres are from the HGM Addendum (2007.)

<sup>4</sup> First evaluated in 2018.

# Hydrogeomorphic Functional Assessment of ARCO Wetland and Riparian Mitigation Lands

Table A- 3. Summary of Landscape Assessment Area variable subindex scores for LAAs in the Jocko River main stem, comparing 2018 and baseline ratings.

LAA (JRMP Reach)		LAA Variables					
		V complex	V habcon	V geomod	V macro	V surfreq	V subfreq
LAA 1 (Reaches 1 and 2)	2018 Rating	0.30	0.80	0.25	0.60	1.00	1.00
	Baseline Rating <sup>1</sup>	0.30	0.80	0.25	0.60	1.00	1.00
	Change baseline to 2018	0.00	0.00	0.00	0.00	0.00	0.00
LAA 2 (Reach 3)	2018 Rating	0.50	0.60	0.50	0.80	0.70	0.35
	Baseline Rating <sup>1</sup>	0.40	0.60	0.50	0.80	0.70	0.35
	Change baseline to 2018	+0.10	0.00	0.00	0.00	0.00	0.00
LAA 3 (Reach 4)	2018 Rating	0.30	0.60	0.25	0.40	0.80	0.50
	Addendum (2006) Rating <sup>2</sup>	0.20	0.60	0.25	0.40	0.80	0.50
	Change baseline to 2018	+0.10	0.00	0.00	0.00	0.00	0.00
LAA 4 (Reach 5)	2018 Rating	0.50	0.80	0.75	0.90	0.80	0.80
	Addendum (2006) Rating <sup>2</sup>	0.40	0.70	0.63	0.90	0.60	0.60
	Change baseline to 2018	+0.10	+0.10	+0.12	0.00	+0.20	+0.20
LAA 5 (Reach 6)	2018 Rating	0.50	0.80	0.70	0.80	0.70	0.60
	Addendum (2006) Rating <sup>2</sup>	0.30	0.70	0.70	0.80	0.60	0.60
	Change baseline to 2018	+0.20	+0.10	0.00	0.00	+0.10	0.00
LAA 6 (Reach 7)	2018 Rating	0.70	0.80	1.00	0.60	1.00	1.00
	Baseline Rating <sup>1</sup>	0.70	0.80	1.00	0.60	1.00	1.00
	Change baseline to 2018	0.00	0.00	0.00	0.00	0.00	0.00
LAA 7 (Reach 8)	2018 Rating	0.80	0.95	0.95	1.00	0.95	0.95
	Addendum (2006) Rating <sup>2</sup>	0.70	0.90	0.80	0.85	0.70	0.80
	Change baseline to 2018	+0.10	+0.05	+0.15	+0.15	+0.25	+0.15

<sup>1</sup> Baseline scores are from the HGM Report (2005).

<sup>2</sup> Baseline scores are from the HGM Addendum (2006).

### Hydrogeomorphic Functional Assessment of ARCO Wetland and Riparian Mitigation Lands

Table A- 4. Summary of Landscape Assessment Area variable subindex scores for LAAs in Jocko River tributaries and Mission Creek, comparing 2018 and baseline ratings.

LAA		LAA Variables					
		V complex	V habcon	V geomod	V macro	V surfreq	V subfreq
North Fork Jocko River	2018 Rating	0.90	0.90	0.30	0.80	1.00	0.20
	Baseline Rating <sup>1</sup>	0.80	0.90	0.25	0.75	1.00	0.10
	Change baseline to 2018	0.10	0.00	0.05	0.05	0.00	0.10
North Valley Creek	2018 Rating	0.30	0.50	0.50	0.70	1.00	0.90
	Baseline Rating <sup>2</sup>	0.30	0.50	0.50	0.70	1.00	0.90
	Change baseline to 2018	0.00	0.00	0.00	0.00	0.00	0.00
Jocko Spring Creek	2018 Rating	0.50	0.80	0.75	0.90	0.80	0.80
	Baseline Rating <sup>3</sup>	0.40	0.70	0.63	0.90	0.60	0.60
	Change baseline to 2018	0.10	0.10	0.12	0.00	0.20	0.20
Finley Creek	2018 Rating	0.50	0.50	0.50	0.80	0.20	0.40
	Baseline Rating <sup>2</sup>	0.20	0.40	0.25	0.40	0.10	0.10
	Change baseline to 2018	0.30	0.10	0.25	0.40	0.10	0.30
Mission Creek <sup>3</sup>	2018 Rating	0.80	0.70	0.70	0.80	0.80	0.80

<sup>1</sup> Baseline scores are from the HGM Report (2005).

<sup>2</sup> Baseline scores are from the HGM Addendum (2006).

<sup>3</sup> Baseline acres are from the HGM Addendum (2007.)

<sup>4</sup> First evaluated in 2018.

## Wetland Assessment Area Data

Table A- 5. Summary of HGM cover type mapping areas (acres) within Jocko River WAAs, comparing 2018 mapping and baseline mapping.

Table A- 6. Summary of HGM cover type mapping areas (acres) within Jocko River tributary WAAs and the Mission Creek WAA, comparing 2018 mapping and baseline mapping.

Table A- 7. Summary of wetland variable subindex scores for WAAs in Jocko River main stem, comparing 2018 and baseline ratings.

Table A- 8. Summary of wetland variable subindex scores for WAAs in Jocko River tributaries and Mission Creek, comparing 2018 and baseline ratings.



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### Hydrogeomorphic Functional Assessment of ARCO Wetland and Riparian Mitigation Lands

Table A- 5. Summary of HGM cover type mapping areas (acres) within Jocko River WAAs, comparing 2018 mapping and baseline mapping.

LAA (JRMP Reach)	Parcel Name		COVERTYPE											TOTALS
			1	2	3	4	5	6	7	8	9	10	11	
LAA 2 (Reach 3)	Lease 4515 (Parcel A & Tract A)	Acres	8.39	32.42	0.22	0.33	4.13	20.26	0.00	7.26	0.13	0.08	0.15	<b>73.37</b>
		% of WAA acres 2018	11.4%	44.2%	0.3%	0.4%	5.6%	27.6%	0.0%	9.9%	0.2%	0.1%	0.2%	<b>100.0%</b>
		Change baseline to 2018	-5.01	0.29	0.22	-0.64	-0.28	15.55	0.00	0.08	0.04	-32.98	0.09	-22.64
		Acres - baseline <sup>1</sup>	13.40	32.13	0.00	0.97	4.41	4.71	0.00	7.18	0.09	33.06	0.06	96.01
		Percent of WAA acres - baseline	14.0%	33.5%	0.0%	1.0%	4.6%	4.9%	0.0%	7.5%	0.1%	34.4%	0.1%	100.0%
LAA 2 (Reach 3)	Bison Range (4513, Radcliffe, Cole- Chenette)	Acres	0.00	30.18	1.62	1.12	21.72	76.94	0.00	5.95	4.28	0.62	0.00	<b>142.43</b>
		% of total acres	0.0%	21.2%	1.1%	0.8%	15.2%	54.0%	0.0%	4.2%	3.0%	0.4%	0.0%	<b>100.0%</b>
		Change baseline to 2018	0.00	17.74	1.62	0.37	8.97	72.13	0.00	5.95	3.64	-44.23	0.00	66.19
		Acres - baseline (4513 only) <sup>1</sup>	0.00	12.44	0.00	0.75	12.75	4.81	0.00	0.00	0.64	44.85	0.00	76.24
		Percent of WAA acres - baseline	0.0%	16.3%	0.0%	1.0%	16.7%	6.3%	0.0%	0.0%	0.8%	58.8%	0.0%	100.0%
LAA 2 (Reach 3)	Cole	Acres <sup>4</sup>	2.45	13.30	0.73	0.25	3.91	0.35	0.06	5.25	0.49	81.27	5.22	<b>113.28</b>
		% of total acres	2.2%	11.7%	0.6%	0.2%	3.5%	0.3%	0.1%	4.6%	0.4%	71.7%	4.6%	<b>100.0%</b>
LAA 2 (Reach 3)	Eggert	Acres <sup>4</sup>	0.00	0.00	0.00	0.00	0.43	0.00	0.00	0.00	0.00	0.00	0.00	<b>0.43</b>
		% of total acres	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	<b>100.0%</b>
LAA 2 (Reach 3)	Stranahan	Acres	0.00	26.98	2.08	1.53	14.58	0.99	0.57	6.09	0.36	0.00	0.00	<b>53.18</b>
		% of total acres	0.0%	50.7%	3.9%	2.9%	27.4%	1.9%	1.1%	11.5%	0.7%	0.0%	0.0%	<b>100.0%</b>
		Change baseline to 2018	0.00	0.22	2.08	-0.38	13.10	0.16	0.57	1.28	-0.21	-14.36	0.00	2.46
		Acres - baseline <sup>1</sup>	0.00	26.76	0.00	1.91	1.48	0.83	0.00	4.81	0.57	14.36	0.00	50.72
		Percent of WAA acres - baseline	0.0%	52.8%	0.0%	3.8%	2.9%	1.6%	0.0%	9.5%	1.1%	28.3%	0.0%	100.0%
LAA 3 (Reach 4)	<u>Nicholson</u> <sup>5</sup>	Acres	0.00	17.75	0.00	0.00	5.93	0.55	0.06	7.16	0.68	0.00	4.59	<b>36.72</b>
		% of total acres	0.0%	48.3%	0.0%	0.0%	16.1%	1.5%	0.2%	19.5%	1.9%	0.0%	12.5%	<b>100.0%</b>
		Change baseline to 2018	0.00	-0.62	0.00	-3.40	-8.26	-5.97	0.01	-2.06	-2.38	-45.52	1.79	-66.41
		Acres - baseline <sup>2</sup>	0.00	18.37	0.00	3.40	14.19	6.52	0.05	9.22	3.06	45.52	2.80	103.13
		Percent of WAA acres - baseline	0.0%	17.8%	0.0%	3.3%	13.8%	6.3%	0.0%	8.9%	3.0%	44.1%	2.7%	100.0%
LAA 4 (Reach 5)	<u>Nicholson</u> <sup>5</sup>	Acres	0.00	6.56	0.00	0.68	24.07	33.08	0.51	3.21	1.33	0.20	1.98	<b>71.63</b>
		% of total acres	0.0%	9.2%	0.0%	0.9%	33.6%	46.2%	0.7%	4.5%	1.9%	0.3%	2.8%	<b>100.0%</b>
		Change baseline to 2018	0.00	-11.81	0.00	-2.72	9.88	26.56	0.46	-6.01	-1.73	-45.32	-0.82	-31.50
		Acres - baseline <sup>2</sup>	0.00	18.37	0.00	3.40	14.19	6.52	0.05	9.22	3.06	45.52	2.80	103.13
		Percent of WAA acres - baseline	0.0%	17.8%	0.0%	3.3%	13.8%	6.3%	0.0%	8.9%	3.0%	44.1%	2.7%	100.0%
LAA 4 (Reach 5)	<u>Squeque</u> <u>(5002, 5015,</u> <u>5037)</u> <sup>5</sup>	Acres	0.00	83.45	4.86	2.62	36.77	218.20	5.14	8.95	6.56	0.49	5.20	<b>372.24</b>
		% of total acres	0.0%	22.4%	1.3%	0.7%	9.9%	58.6%	1.4%	2.4%	1.8%	0.1%	1.4%	<b>100.0%</b>
		Change baseline to 2018	0.00	13.74	3.58	-8.04	-7.26	199.76	5.00	-0.01	-4.04	-207.67	3.99	-0.95
		Acres - baseline <sup>1</sup>	0	69.71	1.28	10.66	44.03	18.44	0.14	8.96	10.6	208.16	1.21	373.19
		Percent of WAA acres - baseline	0.0%	18.7%	0.3%	2.9%	11.8%	4.9%	0.0%	2.4%	2.8%	55.8%	0.3%	100.0%
LAA 4 (Reach 5)	<u>Schall-Powell</u> <sup>5</sup>	Acres	0.00	7.27	2.03	2.96	8.55	25.22	1.14	2.88	0.14	0.24	0.12	<b>50.55</b>
		% of total acres	0.0%	14.4%	4.0%	5.9%	16.9%	49.9%	2.3%	5.7%	0.3%	0.5%	0.2%	<b>100.0%</b>
		Change baseline to 2018	0.00	1.98	2.03	0.82	8.55	21.11	0.88	-3.74	-0.07	-33.15	-0.49	-2.08
		Acres - baseline <sup>1</sup>	0.00	5.29	0.00	2.14	0.00	4.11	0.26	6.62	0.21	33.39	0.61	52.63
		Percent of WAA acres - baseline	0.0%	10.1%	0.0%	4.1%	0.0%	7.8%	0.5%	12.6%	0.4%	63.4%	1.2%	100.0%

# Hydrogeomorphic Functional Assessment of ARCO Wetland and Riparian Mitigation Lands

Table A- 5. Summary of HGM cover type mapping areas (acres) within Jocko River WAAs, comparing 2018 mapping and baseline mapping.

LAA (JRMP Reach)	Parcel Name		COVERTYPE											TOTALS
			1	2	3	4	5	6	7	8	9	10	11	
LAA 5 (Reach 6)	<u>Hatier</u> <sup>5</sup>	Acres	10.25	23.29	0.00	1.10	5.89	45.89	0.76	3.88	1.11	0.00	0.00	<b>92.17</b>
		% of total acres	11.1%	25.3%	0.0%	1.2%	6.4%	49.8%	0.8%	4.2%	1.2%	0.0%	0.0%	<b>100.0%</b>
		Change baseline to 2018	0.41	2.66	0.00	-1.11	-0.54	45.63	0.54	0.04	-0.69	-53.77	-0.33	-7.16
		Acres - baseline <sup>3</sup>	9.84	20.63	0.00	2.21	6.43	0.26	0.22	3.84	1.80	53.77	0.33	99.33
		Percent of WAA acres - baseline	9.9%	20.8%	0.0%	2.2%	6.5%	0.3%	0.2%	3.9%	1.8%	54.1%	0.3%	100.0%
LAA 5 (Reach 6)	<u>Lease 5022</u> <sup>5</sup>	Acres	4.10	24.86	0.15	0.62	0.37	12.16	0.25	3.76	0.51	0.00	0.57	<b>47.35</b>
		% of total acres	8.7%	52.5%	0.3%	1.3%	0.8%	25.7%	0.5%	7.9%	1.1%	0.0%	1.2%	<b>100.0%</b>
		Change baseline to 2018	0.16	9.23	0.15	-0.97	-4.76	11.83	0.25	0.55	0.20	-14.30	0.18	2.52
		Acres - baseline <sup>1</sup>	3.94	15.63	0.00	1.59	5.13	0.33	0.00	3.21	0.31	14.30	0.39	44.83
		Percent of WAA acres - baseline	8.8%	34.9%	0.0%	3.5%	11.4%	0.7%	0.0%	7.2%	0.7%	31.9%	0.9%	100.0%
LAA 5 (Reach 6)	Clinkenbeard	Acres	1.63	18.52	0.00	1.40	3.29	29.57	0.02	2.76	0.00	0.00	0.00	<b>57.19</b>
		% of total acres	2.9%	32.4%	0.0%	2.4%	5.8%	51.7%	0.0%	4.8%	0.0%	0.0%	0.0%	<b>100.0%</b>
		Change baseline to 2018	0.05	-1.85	-0.27	0.97	3.18	29.35	-0.19	0.49	-0.91	-35.34	-1.78	-6.30
		Acres - baseline <sup>2</sup>	1.58	20.37	0.27	0.43	0.11	0.22	0.21	2.27	0.91	35.34	1.78	63.49
		Percent of WAA acres - baseline	2.5%	32.1%	0.4%	0.7%	0.2%	0.3%	0.3%	3.6%	1.4%	55.7%	2.8%	100.0%
LAA 7 (Reach 8)	<u>Dumontier</u> <sup>5</sup>	Acres	0.33	0.51	0.42	0.28	5.54	0.42	0.04	0.36	0.31	0.00	0.00	<b>8.21</b>
		% of total acres	4.0%	6.2%	5.1%	3.4%	67.5%	5.1%	0.5%	4.4%	3.8%	0.0%	0.0%	<b>100.0%</b>
		Change baseline to 2018	0.33	0.51	0.42	0.28	-0.26	-0.47	-0.62	0.14	-0.16	-0.02	0.00	0.15
		Acres - baseline <sup>2</sup>	0.00	0.00	0.00	0.00	5.80	0.89	0.66	0.22	0.47	0.02	0.00	8.06
		Percent of WAA acres - baseline	0.0%	0.0%	0.0%	0.0%	72.0%	11.0%	8.2%	2.7%	5.8%	0.2%	0.0%	100.0%
LAA 7 (Reach 8)	<u>Demonstration Reach (5807; 5757)</u> <sup>5</sup>	Acres	39.74	33.61	2.31	1.70	26.67	0.88	0.36	6.80	0.35	0.00	0.61	<b>113.03</b>
		% of total acres	35.2%	29.7%	2.0%	1.5%	23.6%	0.8%	0.3%	6.0%	0.3%	0.0%	0.5%	<b>100.0%</b>
		Change baseline to 2018	39.41	-4.66	2.31	-2.97	23.62	-1.72	0.19	0.04	-0.26	-72.98	0.57	-16.45
		Acres - baseline <sup>1</sup>	0.33	38.27	0.00	4.67	3.05	2.60	0.17	6.76	0.61	72.98	0.04	129.48
		Percent of WAA acres - baseline	0.3%	29.6%	0.0%	3.6%	2.4%	2.0%	0.1%	5.2%	0.5%	56.4%	0.0%	100.0%
		% of total acres	0.2%	12.8%	0.0%	0.1%	41.7%	38.0%	0.2%	4.4%	2.6%	0.0%	0.0%	<b>100.0%</b>

<sup>1</sup> Baseline scores are from the HGM Report (2005).

<sup>2</sup> Baseline scores are from the HGM Addendum (2006).

<sup>3</sup> Baseline acres are from the HGM Addendum (2007.)

<sup>4</sup> Baseline assessments not conducted for these parcels.

<sup>5</sup> WAAs where field data were collected in 2018 for the HGM Assessments.

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Table A- 6. Summary of HGM cover type mapping areas (acres) within Jocko River tributary WAAs and the Mission Creek WAA, comparing 2018 mapping and baseline mapping.

LAA (JRMP Reach)	Parcel Name		COVERTYPE											TOTALS
			1	2	3	4	5	6	7	8	9	10	11	
North Fork Jocko River	Lease 5768	Acres	23.22	8.51	0.00	0.41	0.00	0.00	0.54	3.12	0.00	0.00	0.00	35.80
		% of total acres	64.9%	23.8%	0.0%	1.1%	0.0%	0.0%	1.5%	8.7%	0.0%	0.0%	0.0%	100.0%
		Change baseline to 2018	-10.24	8.51	0.00	0.41	0.00	-0.72	-1.00	1.54	-0.31	0.00	0.00	-1.81
		Acres - baseline <sup>1</sup>	33.46	0.00	0.00	0.00	0.00	0.72	1.54	1.58	0.31	0.00	0.00	37.61
		Percent of WAA acres - baseline	89.0%	0.0%	0.0%	0.0%	0.0%	1.9%	4.1%	4.2%	0.8%	0.0%	0.0%	100.0%
North Fork Valley Creek	<b>Nicholson (North Valley Creek) <sup>5</sup></b>	Acres	0.00	0.00	0.00	0.00	16.96	6.68	0.00	0.00	0.00	0.00	0.31	23.95
		% of total acres	0.0%	0.0%	0.0%	0.0%	70.8%	27.9%	0.0%	0.0%	0.0%	0.0%	1.3%	100.0%
		Change baseline to 2018	-0.44	0.00	0.00	0.00	-1.06	4.35	0.00	-1.15	0.00	-36.75	-1.35	-36.40
		Acres - baseline <sup>2</sup>	0.44	0.00	0.00	0.00	18.02	2.33	0.00	1.15	0.00	36.75	1.66	60.35
		Percent of WAA acres - baseline	0.7%	0.0%	0.0%	0.0%	29.9%	3.9%	0.0%	1.9%	0.0%	60.9%	2.8%	100.0%
Jocko Spring Creek	Jefferson	Acres	0.00	0.00	0.00	0.00	2.94	39.48	0.00	1.68	0.00	0.49	0.56	45.15
		% of total acres	0.0%	0.0%	0.0%	0.0%	6.5%	87.4%	0.0%	3.7%	0.0%	1.1%	1.2%	100.0%
		Change baseline to 2018	0.00	0.00	0.00	0.00	1.60	35.17	0.00	-0.01	-0.05	-36.79	0.00	-0.08
		Acres - baseline <sup>3</sup>	0.00	0.00	0.00	0.00	1.34	4.31	0.00	1.69	0.05	37.28	0.56	45.23
		Percent of WAA acres - baseline	0.0%	0.0%	0.0%	0.0%	3.0%	9.5%	0.0%	3.7%	0.1%	82.4%	1.2%	100.0%
Finley Creek	North Parcel, with Addition	Acres	0.00	22.55	0.00	0.00	36.71	218.27	0.00	2.40	1.04	0.03	2.18	283.18
		% of total acres	0.0%	8.0%	0.0%	0.0%	13.0%	77.1%	0.0%	0.8%	0.4%	0.0%	0.8%	100.0%
		Change baseline to 2018	0.00	1.46	0.00	0.00	11.60	183.62	0.00	-0.21	1.04	-207.66	2.18	-7.97
		Acres - baseline <sup>2</sup>	0.00	21.09	0.00	0.00	25.11	34.65	0.00	2.61	0.00	207.69	0.00	291.15
		Percent of WAA acres - baseline	0.0%	7.2%	0.0%	0.0%	8.6%	11.9%	0.0%	0.9%	0.0%	71.3%	0.0%	100.0%
	Leases 5029 & 5030	Acres	0.00	27.30	0.00	0.00	5.68	13.08	0.00	1.40	0.00	0.29	0.00	47.75
		% of total acres	0.0%	57.2%	0.0%	0.0%	11.9%	27.4%	0.0%	2.9%	0.0%	0.6%	0.0%	100.0%
		Change baseline to 2018	0.00	1.30	0.00	0.00	-2.11	13.08	0.00	-0.47	0.00	-12.61	0.00	-0.81
		Acres - baseline <sup>2</sup>	0.00	26.00	0.00	0.00	7.79	0.00	0.00	1.87	0.00	12.90	0.00	48.56
		Percent of WAA acres - baseline	0.0%	53.5%	0.0%	0.0%	16.0%	0.0%	0.0%	3.9%	0.0%	26.6%	0.0%	100.0%
	Burlington Northern	Acres <sup>4</sup>	0.00	5.11	0.00	0.00	3.10	11.38	0.00	0.30	0.00	0.08	0.14	20.11
		% of total acres	0.0%	25.4%	0.0%	0.0%	15.4%	56.6%	0.0%	1.5%	0.0%	0.4%	0.7%	100.0%
Mission Creek	<b>Mission Creek (McLeod Allotment) <sup>5</sup></b>	Acres <sup>4</sup>	0.13	9.16	0.00	0.09	29.85	27.22	0.14	3.13	1.88	0.00	0.00	71.60
		% of total acres	0.2%	12.8%	0.0%	0.1%	41.7%	38.0%	0.2%	4.4%	2.6%	0.0%	0.0%	100.0%

<sup>1</sup> Baseline scores are from the HGM Report (2005).

<sup>2</sup> Baseline scores are from the HGM Addendum (2006).

<sup>3</sup> Baseline acres are from the HGM Addendum (2007.)

<sup>4</sup> Baseline assessments not conducted for these parcels.

<sup>5</sup> WAAs where field data were collected in 2018 for the HGM Assessments.

# Hydrogeomorphic Functional Assessment of ARCO Wetland and Riparian Mitigation Lands

Table A- 7. Summary of wetland variable subindex scores for WAAs in Jocko River main stem, comparing 2018 and baseline ratings.

LAA (JRMP Reach)	Parcel Name (Name at Baseline Assessment)		WAA Variables						
			V <sub>landuse</sub>	V <sub>orgdecomp</sub>	V <sub>dtree</sub>	V <sub>shrub</sub>	V <sub>herb</sub>	V <sub>lwd</sub>	V <sub>npcov</sub>
LAA 2 (Reach 3) <sup>4</sup>	Lease 4515 (Parcel A & Tract A)	2018 Rating	1.00	0.91	1.00	0.92	0.79	0.00	0.81
		Baseline Rating <sup>1</sup>	0.72	0.58	1.00	0.93	0.67	0.00	0.84
		Change baseline to 2018	0.28	0.33	0.00	-0.01	0.12	0.00	-0.03
	Bison Range (4513, Radcliffe, Cole-Chenette)	2018 Rating	1.00	0.99	1.00	1.00	0.91	0.00	0.75
		Baseline Rating <sup>1</sup>	0.42	0.45	0.90	1.00	0.68	0.00	0.74
		Change baseline to 2018	0.58	0.54	0.10	0.00	0.23	0.00	0.07
	Stranahan	2018 Rating	1.00	0.92	0.80	0.99	0.64	0.40	0.87
		Baseline Rating <sup>1</sup>	0.64	0.54	0.50	0.98	0.27	0.00	0.89
		Change baseline to 2018	0.36	0.38	0.30	0.01	0.37	0.40	-0.02
LAA 3 (Reach 4)	<u>Nicholson</u> <sup>5</sup>	2018 Rating	0.94	0.93	0.50	0.82	1.00	0.17	0.54
		Baseline Rating <sup>2</sup>	0.55	0.48	0.50	0.85	0.85	0.00	0.58
		Change baseline to 2018	0.39	0.45	0.00	-0.03	0.15	0.17	-0.04
LAA 4 (Reach 5)	<u>Nicholson</u> <sup>5</sup>	2018 Rating	0.94	0.93	0.50	0.82	1.00	0.17	0.54
		Baseline Rating <sup>2</sup>	0.55	0.48	0.50	0.85	0.85	0.00	0.58
		Change baseline to 2018	0.39	0.45	0.00	-0.03	0.15	0.17	-0.04
LAA 4 (Reach 5)	<u>Squeque (5002, 5015, 5037)</u> <sup>5</sup>	2018 Rating	0.98	0.94	0.80	0.96	0.93	0.15	0.62
		Baseline Rating 5002 <sup>1</sup>	0.49	0.44	0.90	0.97	0.92	0.15	0.67
		Baseline Rating 5015 <sup>1</sup>	0.58	0.40	0.75	0.81	0.99	0.00	0.65
		Baseline Rating 5037 <sup>1</sup>	0.65	0.55	0.85	0.92	1.00	0.00	0.69
		Change baseline 5037 to 2018	0.33	0.39	-0.05	0.04	-0.07	0.15	-0.07
	<u>Schall-Powell</u> <sup>5</sup>	2018 Rating	0.99	0.95	0.70	0.70	0.95	0.15	0.23
		Baseline Rating <sup>1</sup>	0.40	0.28	0.90	0.62	1.00	0.25	0.64
		Change baseline to 2018	0.59	0.67	-0.20	0.08	-0.05	-0.10	-0.41
LAA 5 (Reach 6)	<u>Hatier</u> <sup>5</sup>	2018 Rating	1.00	0.98	0.80	0.67	0.88	0.42	0.74
		Baseline Rating <sup>3</sup>	0.53	0.45	0.90	0.92	0.92	0.00	0.64
		Change baseline to 2018	0.47	0.53	-0.10	-0.25	-0.04	0.42	0.10
	<u>Lease 5022</u> <sup>5</sup>	2018 Rating	0.99	0.99	0.90	0.80	0.98	0.25	0.62
		Baseline Rating <sup>1</sup>	0.67	0.64	0.64	0.90	0.88	0.00	0.68
		Change baseline to 2018	0.32	0.35	0.26	-0.10	0.10	0.25	-0.06
	Clinkenbeard	2018 Rating	1.00	0.98	0.60	0.77	0.91	0.20	0.42
		Baseline Rating <sup>2</sup>	0.38	0.41	0.16	0.80	0.71	0.30	0.72
		Change baseline to 2018	0.62	0.57	0.44	-0.03	0.20	-0.10	-0.30



# Hydrogeomorphic Functional Assessment of ARCO Wetland and Riparian Mitigation Lands

Table A- 7. Summary of wetland variable subindex scores for WAAs in Jocko River main stem, comparing 2018 and baseline ratings.

LAA (JRMP Reach)	Parcel Name (Name at Baseline Assessment)		WAA Variables						
			V <sub>landuse</sub>	V <sub>orgdecomp</sub>	V <sub>dtree</sub>	V <sub>shrub</sub>	V <sub>herb</sub>	V <sub>lwd</sub>	V <sub>npcov</sub>
LAA 7 (Reach 8)	<u>Dumontier</u> <sup>5</sup>	2018 Rating	1.00	1.00	0.40	0.96	0.92	0.35	0.63
		Baseline Rating <sup>2</sup>	0.86	0.95	0.00	1.00	1.00	0.55	0.77
		Change baseline to 2018	0.14	0.05	0.40	-0.04	-0.09	-0.20	-0.15
	<u>Demonstration Reach (5807; 5757)</u> <sup>5</sup>	2018 Rating	0.99	0.98	0.40	0.92	1.00	0.30	0.69
		Baseline Rating 5807 <sup>1</sup>	0.42	0.35	0.70	0.99	0.72	0.00	0.65
		Baseline Rating 5757 <sup>1</sup>	0.52	0.82	0.50	0.73	0.76	0.00	0.67
		Change baseline 5807 to 2018	0.57	0.63	-0.30	-0.07	0.28	0.30	0.04
	<sup>1</sup> Baseline scores are from the HGM Report (2005).		<sup>3</sup> Baseline acres are from the HGM Addendum (2007.)				<sup>5</sup> WAAs where field data were collected in 2018 for the HGM Assessments.		
<sup>2</sup> Baseline scores are from the HGM Addendum (2006).		<sup>4</sup> The Cole and Eggert parcels in LAA 2 were not evaluated in 2018.							

Table A- 8. Summary of wetland variable subindex scores for WAAs in Jocko River tributaries and Mission Creek, comparing 2018 and baseline ratings.

LAA (JRMP Reach)	Parcel Name (Name at Baseline Assessment)		WAA Variables						
			V <sub>landuse</sub>	V <sub>orgdecomp</sub>	V <sub>dtree</sub>	V <sub>shrub</sub>	V <sub>herb</sub>	V <sub>lwd</sub>	V <sub>npcov</sub>
North Fork Jocko River	Lease 5768	2018 Rating	1.00	0.79	0.80	0.90	1.00	0.50	0.75
		Baseline Rating <sup>1</sup>	0.34	0.76	0.75	0.90	0.61	0.55	0.72
		Change baseline to 2018	0.66	0.03	0.05	0.00	0.39	-0.05	0.03
North Fork Valley Creek	<b>Nicholson (North Valley Creek)</b> <sup>4</sup>	2018 Rating	0.99	0.99	0.00	1.00	1.00	0.00	0.51
		Baseline Rating <sup>2</sup>	0.55	0.41	0.50	0.56	1.00	0.00	0.93
		Change baseline to 2018	0.44	0.58	-0.50	0.44	0.00	0.00	-0.42
Jocko Spring Creek	Jefferson	2018 Rating	0.98	0.98	0.00	0.60	1.00	0.00	0.23
		Baseline Rating <sup>3</sup>	0.47	0.22	0.00	0.35	1.00	0.00	1.00
		Change baseline to 2018	0.51	0.76	0.00	0.25	0.00	0.00	-0.77
Finley Creek	North, with Addition	2018 Rating	0.99	0.99	0.95	0.80	1.00	0.00	0.81
		Baseline Rating <sup>2</sup>	0.31	0.35	0.97	0.84	0.89	0.00	0.76
		Change baseline to 2018	0.68	0.64	-0.02	-0.04	0.11	0.00	0.05
	Lease 5029 & 5030 (formerly Thomas Lease)	2018 Rating	1.00	0.99	1.00	0.96	1.00	0.00	0.58
		Baseline Rating <sup>2</sup>	0.55	0.75	1.00	0.96	0.95	0.00	0.64
		Change baseline to 2018	0.45	0.24	0.00	0.00	0.05	0.00	-0.06
	Burlington Northern	2018 Rating <sup>4</sup>	0.99	0.99	0.90	1.00	0.96	0.00	0.49
Mission Creek	<b>Mission Creek (McLeod Allotment)</b> <sup>5</sup>	2018 Rating <sup>4</sup>	0.63	0.83	0.70	1.00	0.77	0.00	0.56

<sup>1</sup> Baseline scores are from the HGM Report (2005).

<sup>2</sup> Baseline scores are from the HGM Addendum (2006).

<sup>3</sup> Baseline acres are from the HGM Addendum (2007.)

<sup>4</sup> First evaluated in 2018.

<sup>5</sup> WAAs where field data were collected in 2018 for the HGM Assessments.

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## Functional Capacity Index Scores and Cumulative HGM Scores

Table A- 9. Summary of Functional Capacity Index scores for LAAs in Jocko River main stem, comparing 2018 and baseline ratings.

Table A- 10. Summary of Functional Capacity Index scores for LAAs in Jocko River tributaries and the Mission Creek watershed, comparing 2018 and baseline ratings.

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Hydrogeomorphic Functional Assessment of ARCO Wetland and Riparian Mitigation Lands

Table A- 9. Summary of Functional Capacity Index scores for WAAs in Jocko River main stem, comparing 2018 and baseline ratings.

Functional Capacity Index Scores											
LAA	WAA		1	2	3	4	5	6	7	8	
			Surface-Groundwater Storage and Flow	Nutrient Cycling	Retention of Organic and Inorganic Particles	Generation and Export of Organic Carbon	Characteristic Plant Community	Characteristic Aquatic Invertebrate Habitats	Characteristic Vertebrate Habitats	Floodplain Interspersion and Connectivity	TOTAL
LAA 2	Lease 4515 (Parcel A & Tract A) 1	2018 Office Evaluation	0.56	0.74	0.50	0.82	0.81	0.59	0.76	0.60	5.37
		Baseline Assessment	0.56	0.59	0.49	0.81	0.79	0.56	0.73	0.56	5.09
		Change baseline to 2018	0.00	0.15	0.01	0.01	0.02	0.03	0.03	0.04	0.28
	Bison Range (4513, Radcliffe, Cole-Chenette)	2018 Office Evaluation	0.56	0.78	0.50	0.85	0.80	0.59	0.77	0.60	5.45
		Baseline Assessment (4513 only)	0.56	0.54	0.49	0.80	0.74	0.56	0.72	0.53	4.94
		Change baseline to 2018	0.00	0.24	0.01	0.05	0.09	0.03	0.06	0.07	0.55
	Stranahan	2018 Office Evaluation	0.56	0.72	0.55	0.78	0.80	0.59	0.73	0.60	5.32
		Baseline Assessment	0.56	0.50	0.49	0.66	0.69	0.56	0.64	0.55	4.65
		Change baseline to 2018	0.00	0.22	0.06	0.12	0.11	0.03	0.09	0.05	0.67
LAA 3	Nicholson - North	2018 Assessment	0.38	0.60	0.32	0.68	0.59	0.50	0.61	0.44	4.13
		Baseline Assessment	0.53	0.47	0.43	0.71	0.60	0.55	0.63	0.52	4.44
		Change baseline to 2018	-0.15	0.13	-0.10	-0.03	-0.01	-0.05	-0.02	-0.08	-0.31
LAA 4	Nicholson South	2018 Assessment	0.79	0.71	0.67	0.81	0.62	0.75	0.73	0.78	5.85
		Baseline Assessment	0.53	0.47	0.43	0.71	0.60	0.55	0.63	0.52	4.44
		Change baseline to 2018	0.26	0.24	0.24	0.10	0.01	0.20	0.10	0.26	1.41
	Squeque (5002, 5015, 5037)	2018 Assessment	0.79	0.75	0.66	0.87	0.70	0.75	0.79	0.78	6.10
		Baseline Assessment - 5002	0.66	0.55	0.57	0.84	0.73	0.63	0.75	0.62	5.34
		Baseline Assessment - 5015	0.66	0.52	0.54	0.80	0.69	0.63	0.72	0.63	5.19
		Baseline Assessment - 5037	0.66	0.59	0.55	0.83	0.74	0.63	0.75	0.63	5.39
		Change baseline 5037 to 2018	0.13	0.16	0.11	0.04	-0.04	0.12	0.04	0.15	0.71
	Schall Powell	2018 Assessment	0.79	0.72	0.66	0.82	0.40	0.75	0.70	0.78	5.62
		Baseline Assessment	0.66	0.45	0.58	0.79	0.68	0.63	0.71	0.60	5.11
		Change baseline to 2018	0.13	0.27	0.08	0.02	-0.27	0.13	-0.02	0.18	0.51
LAA 5	Hatier	2018 Assessment	0.70	0.73	0.65	0.77	0.73	0.65	0.74	0.72	5.68
		Baseline Assessment	0.68	0.50	0.55	0.80	0.70	0.58	0.71	0.62	5.13
		Change baseline to 2018	0.02	0.23	0.11	-0.03	0.03	0.08	0.02	0.10	0.55
	5022	2018 Assessment	0.70	0.76	0.63	0.82	0.70	0.65	0.76	0.72	5.74
		Baseline Assessment	0.68	0.54	0.55	0.75	0.68	0.58	0.68	0.64	5.10
		Change baseline to 2018	0.02	0.22	0.08	0.07	0.02	0.08	0.08	0.08	0.64
	Clinkenbeard	2018 Office Evaluation	0.70	0.72	0.62	0.75	0.54	0.65	0.69	0.72	5.39
		Baseline Assessment	0.68	0.41	0.59	0.62	0.60	0.58	0.60	0.60	4.68
		Change baseline to 2018	0.02	0.31	0.03	0.13	-0.06	0.07	0.09	0.12	0.71
LAA 7	Dumontier	2018 Assessment	0.96	0.84	0.86	0.85	0.69	0.93	0.82	0.94	6.89
		Baseline Assessment	0.79	0.76	0.75	0.72	0.72	0.76	0.74	0.80	6.04
		Change baseline to 2018	0.17	0.08	0.11	0.13	-0.03	0.16	0.08	0.14	0.85
	Demonstration Reach (5807 & 5757)	2018 Assessment	0.96	0.85	0.85	0.87	0.73	0.93	0.83	0.94	6.96
		Baseline Assessment (5807, part)	0.79	0.58	0.67	0.79	0.71	0.76	0.78	0.75	5.83
		Baseline Assessment (5757, part)	0.79	0.72	0.67	0.72	0.67	0.76	0.72	0.76	5.81
		Change baseline 5807 part to 2018	0.17	0.26	0.18	0.08	0.03	0.16	0.06	0.19	1.13



Hydrogeomorphic Functional Assessment of ARCO Wetland and Riparian Mitigation Lands

Table A- 10. Summary of Functional Capacity Index scores for WAAs in Jocko River tributaries and the Mission Creek watershed, comparing 2018 and baseline ratings.

Functional Capacity Index Scores											
LAA	WAA		1	2	3	4	5	6	7	8	
			Surface-Groundwater Storage and Flow	Nutrient Cycling	Retention of Organic and Inorganic Particles	Generation and Export of Organic Carbon	Characteristic Plant Community	Characteristic Aquatic Invertebrate Habitats	Characteristic Vertebrate Habitats	Floodplain Interspersion and Connectivity	TOTAL
North Fork Jocko River	Lease 5768	2018 Office Evaluation	0.45	0.86	0.49	0.90	0.82	0.73	0.88	0.57	5.70
		Baseline Assessment <sup>1</sup>	0.39	0.77	0.44	0.81	0.74	0.66	0.80	0.47	5.08
		Change baseline to 2018	0.06	0.09	0.05	0.09	0.08	0.06	0.08	0.10	0.62
North Valley Creek	Nicholson (North Valley Creek)	2018 Assessment	0.66	0.58	0.50	0.75	0.54	0.73	0.63	0.64	5.02
		Baseline Assessment <sup>2</sup>	0.66	0.44	0.50	0.76	0.74	0.73	0.68	0.57	5.09
		Change baseline to 2018	0.00	0.14	0.00	-0.01	-0.20	0.00	-0.06	0.06	-0.06
Jocko Spring Creek	Jefferson	2018 Office Evaluation	0.79	0.64	0.64	0.67	0.35	0.75	0.59	0.78	5.21
		Baseline Assessment <sup>3</sup>	0.66	0.34	0.55	0.58	0.66	0.63	0.62	0.61	4.65
		Change baseline to 2018	0.13	0.30	0.09	0.09	-0.31	0.12	-0.03	0.17	0.56
Finley Creek	North, with Addition	2018 Office Evaluation	0.48	0.77	0.43	0.68	0.81	0.48	0.67	0.54	4.85
		Baseline Assessment <sup>2</sup>	0.22	0.40	0.21	0.47	0.74	0.20	0.49	0.25	2.98
		Change baseline to 2018	0.26	0.37	0.22	0.21	0.07	0.28	0.18	0.29	1.87
	Leases 5029 & 5030	2018 Office Evaluation	0.48	0.79	0.43	0.70	0.71	0.48	0.67	0.54	4.79
		Baseline Assessment <sup>2</sup>	0.22	0.53	0.21	0.49	0.71	0.20	0.49	0.27	3.12
		Change baseline to 2018	0.26	0.26	0.22	0.21	0.00	0.28	0.18	0.27	1.67
	Burlington Northern	2018 Office Evaluation <sup>4</sup>	0.48	0.78	0.43	0.69	0.64	0.48	0.65	0.54	4.69
Mission Creek	Mission Creek (McLeod Allotment)	2018 Assessment <sup>4</sup>	0.75	0.82	0.65	0.81	0.68	0.80	0.77	0.74	6.00

<sup>1</sup> Baseline scores are from the HGM Report (2005).

<sup>2</sup> Baseline scores are from the HGM Addendum (2006).

<sup>3</sup> Baseline acres are from the HGM Addendum (2007.)

<sup>4</sup> First evaluated in 2018.

## Appendix B. HGM Assessment Maps and Figures

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### Landscape Assessment Area Figures

Figure B- 1. Overview of landscape assessment areas and the ecological floodplain along the lower main stem Jocko River.

Figure B- 2. Overview of LAA 1 in the Jocko River main stem.

Figure B- 3. Overview of LAA 2 in the Jocko River main stem.

Figure B- 4. Overview of LAA 3 in the Jocko River main stem.

Figure B- 5. Overview of LAA 4 in the Jocko River main stem.

Figure B- 6. Overview of LAA 5 in the Jocko River main stem.

Figure B- 7. Overview of LAA 6 in the Jocko River main stem.

Figure B- 8. Overview of LAA 7 in the Jocko River main stem.

Figure B- 9. Overview of the Finley Creek LAA.

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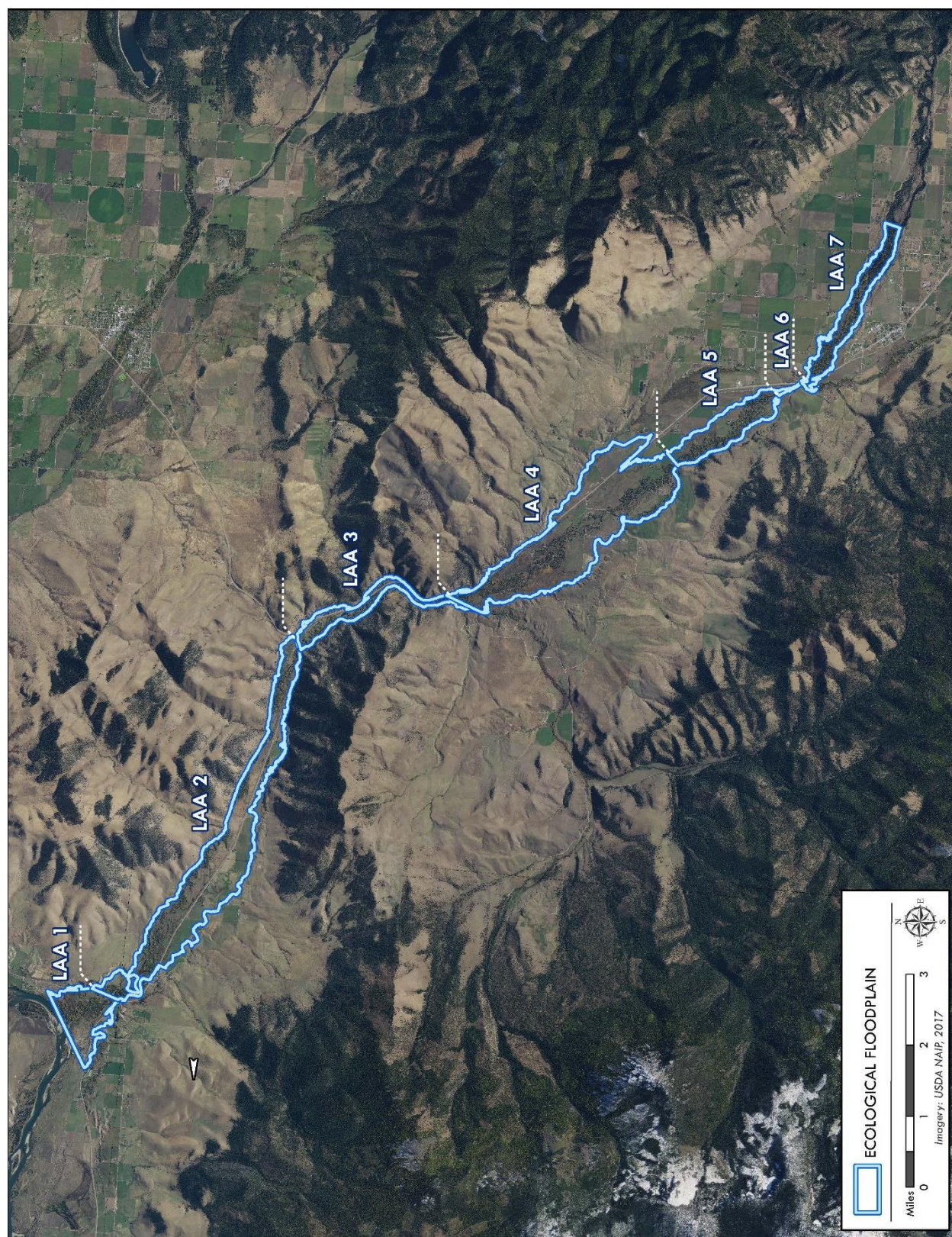


Figure B- 1. Overview of landscape assessment areas and the ecological floodplain along the lower main stem Jocko River.



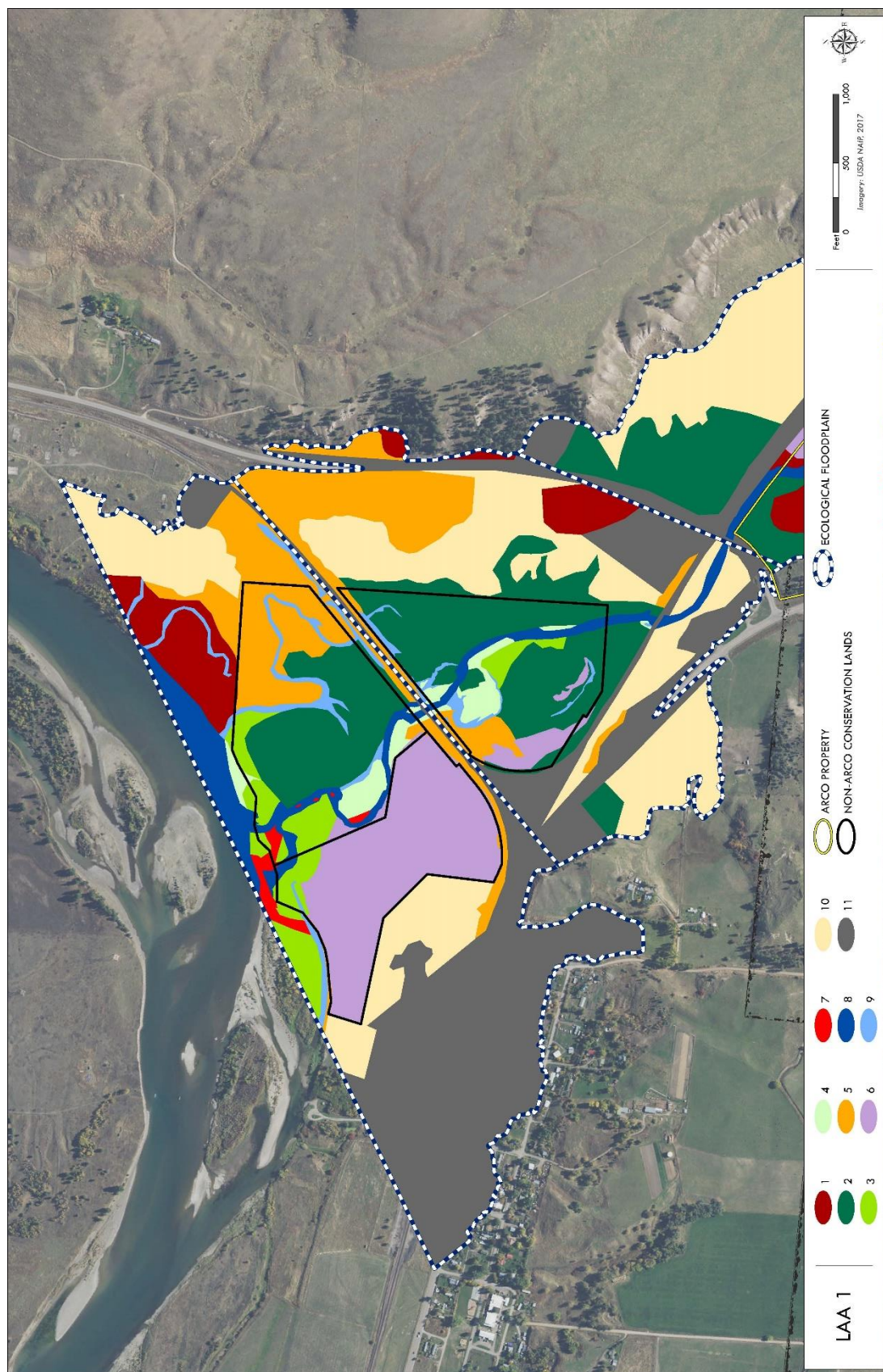


Figure B- 2. Overview of LAA 1 in the Jocko River main stem.



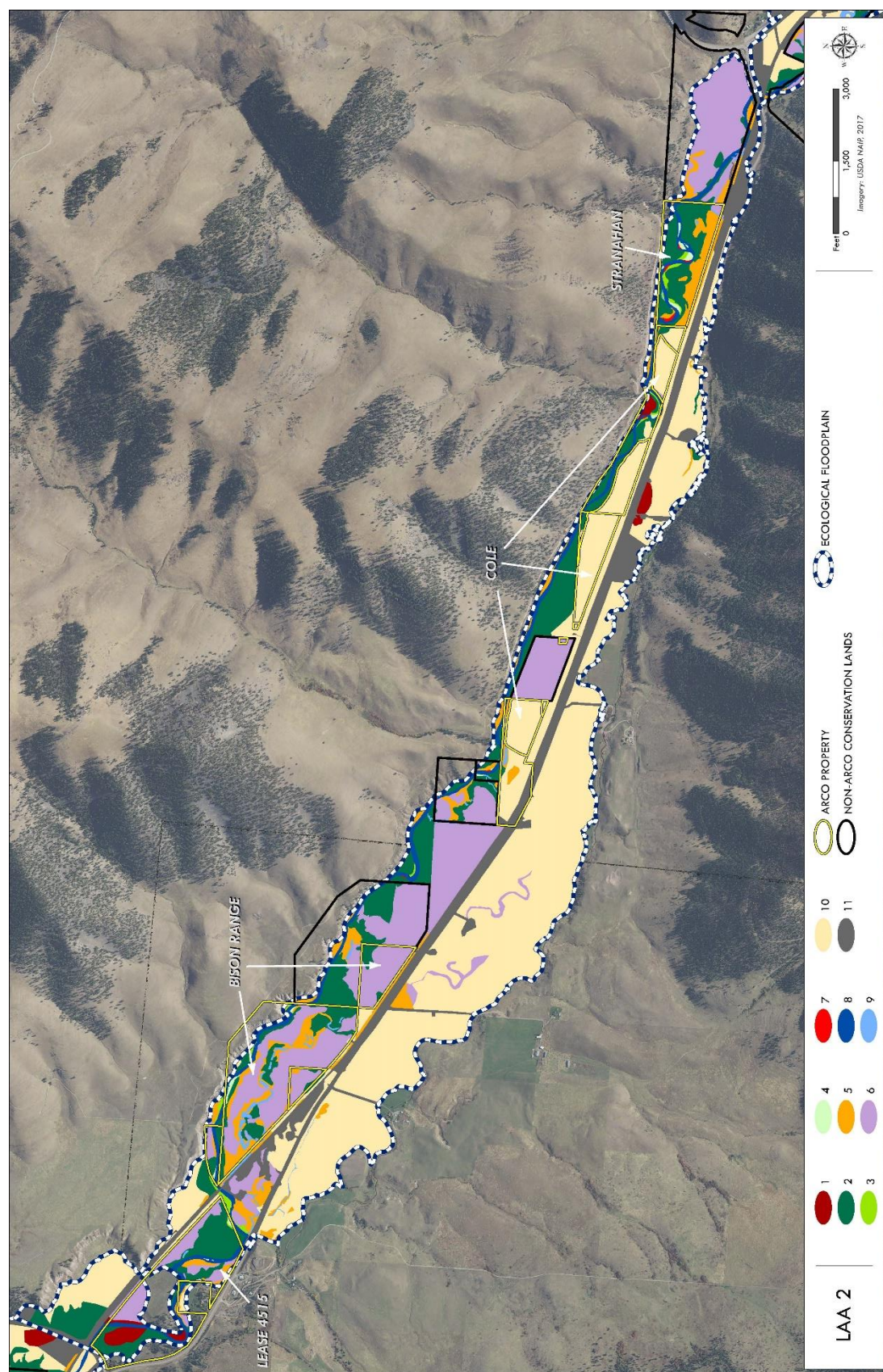


Figure B- 3. Overview of LAA 2 in the Jocko River main stem.



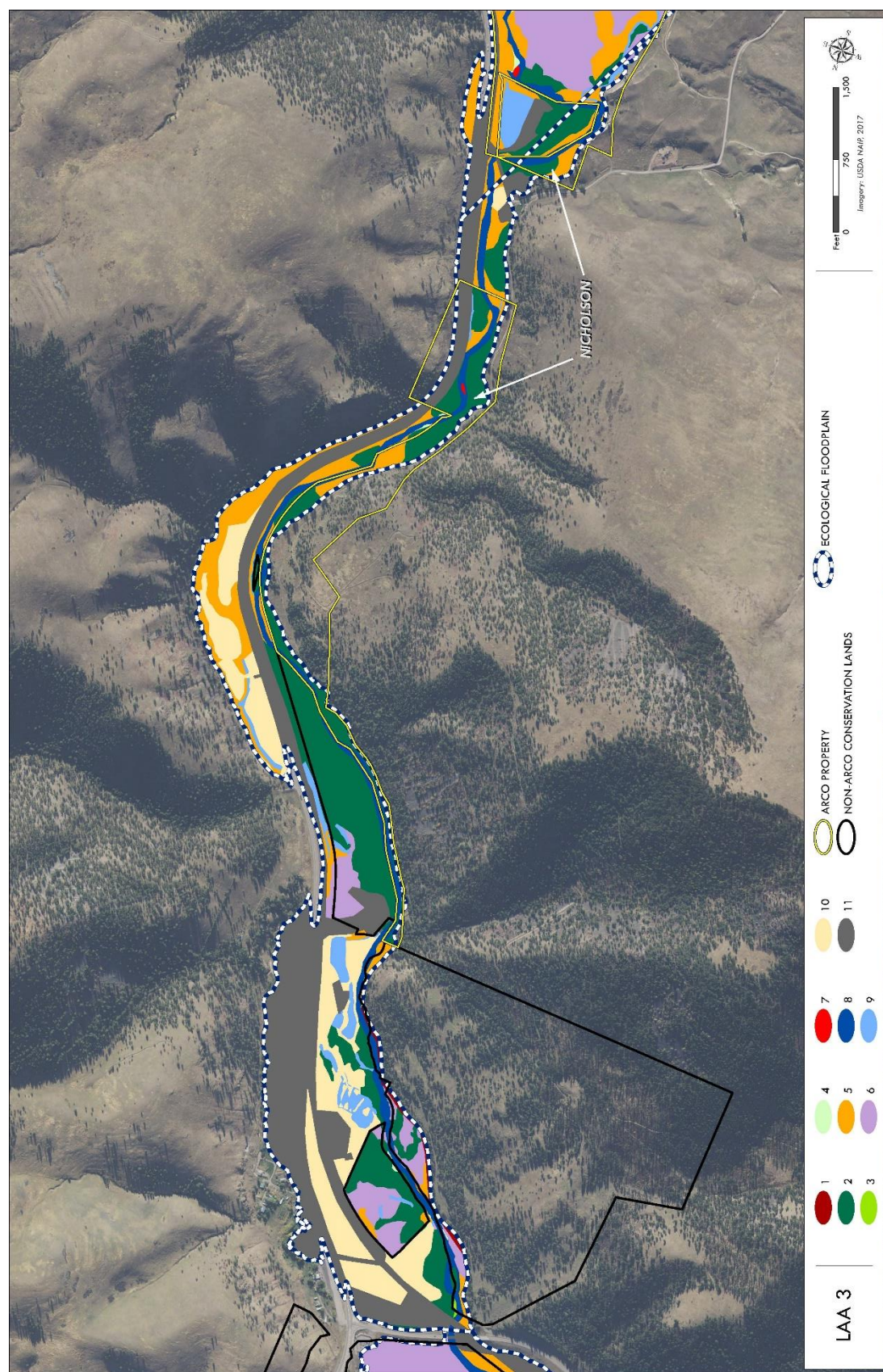


Figure B-4. Overview of LAA 3 in the Jocko River main stem.



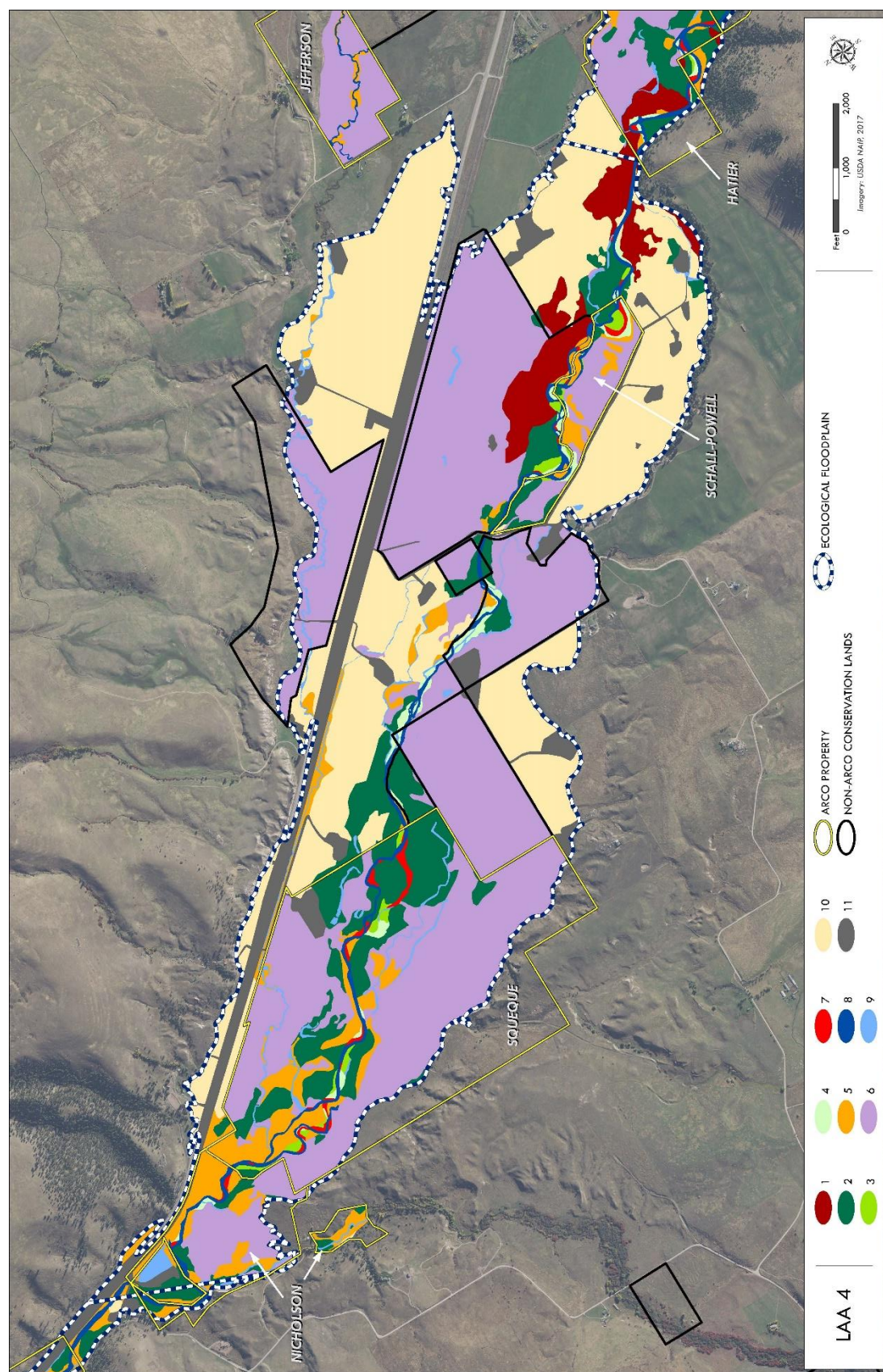


Figure B- 5. Overview of LAA 4 in the Jocko River main stem.



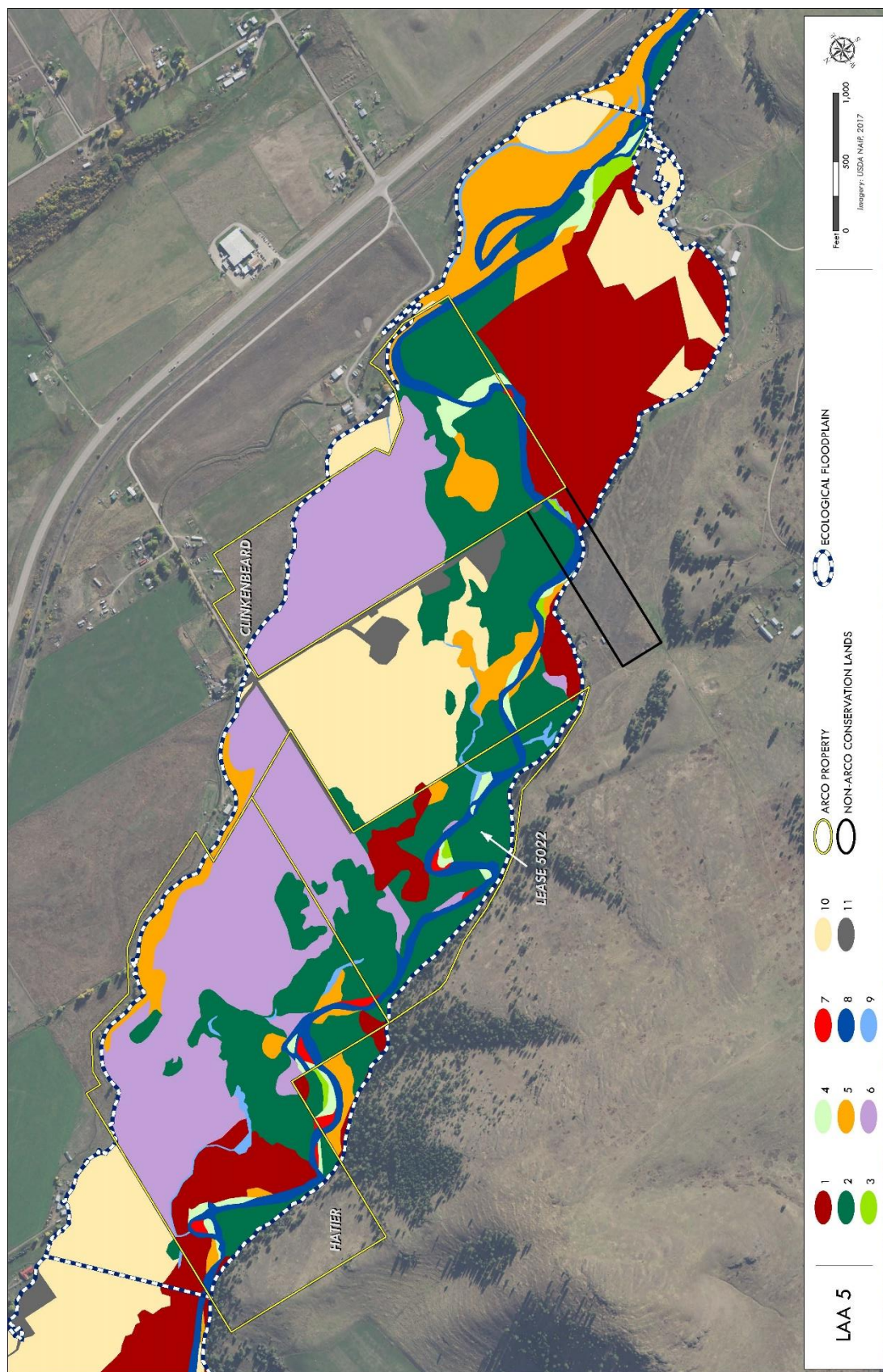


Figure B- 6. Overview of LAA 5 in the Jocko River main stem.



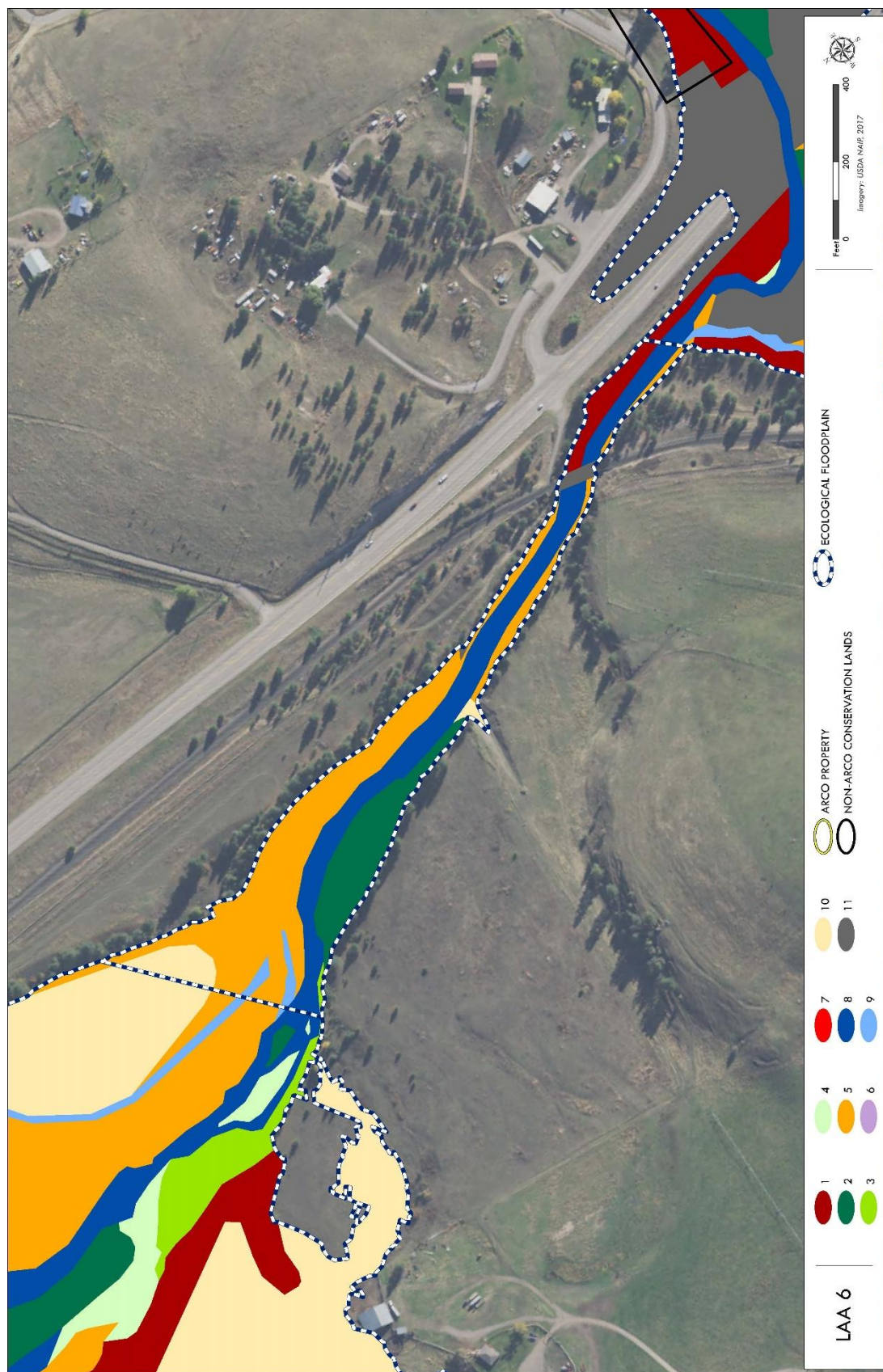


Figure B- 7. Overview of LAA 6 in the Jocko River main stem.



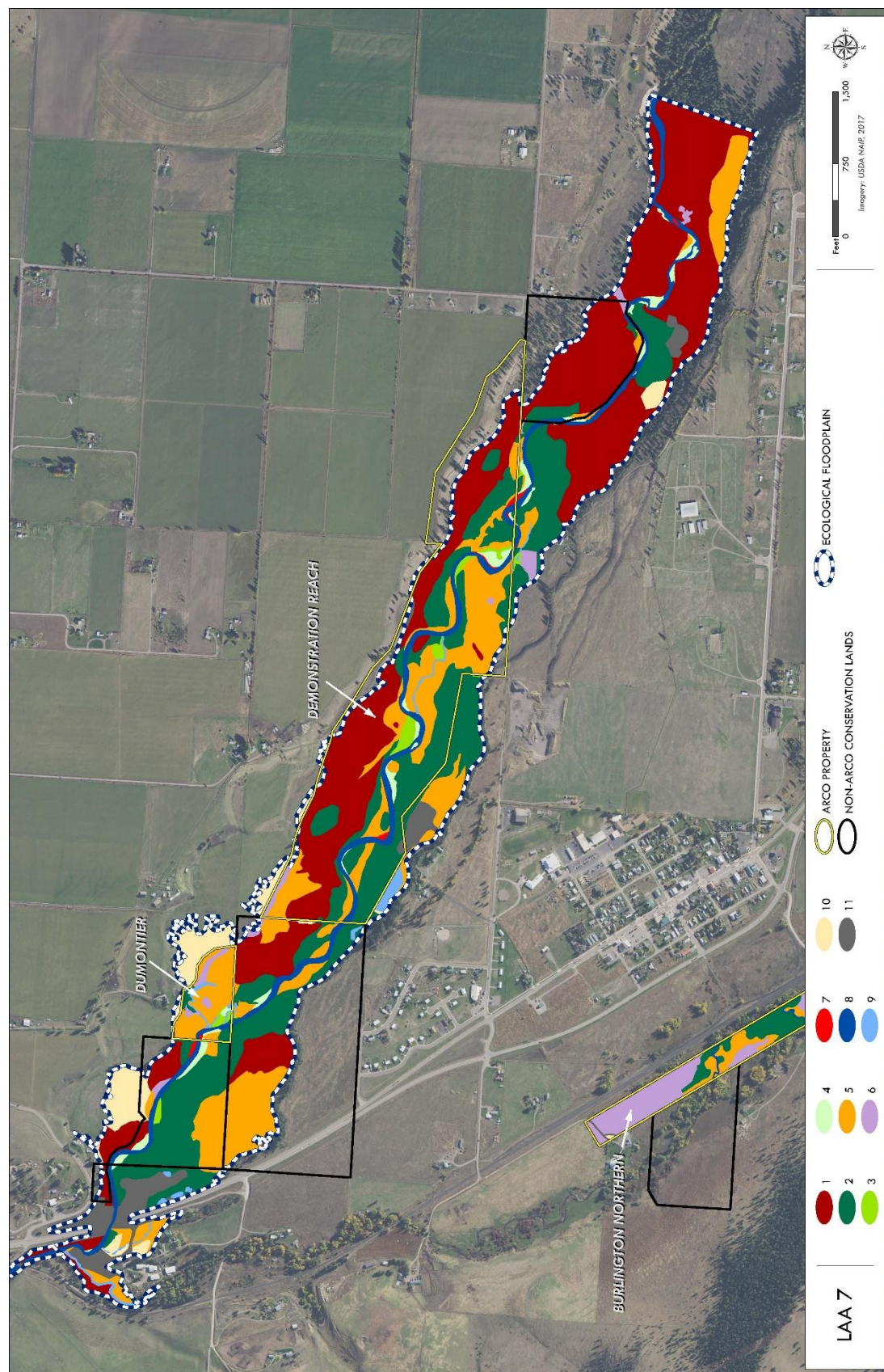


Figure B- 8. Overview of LAA 7 in the Jocko River main stem.



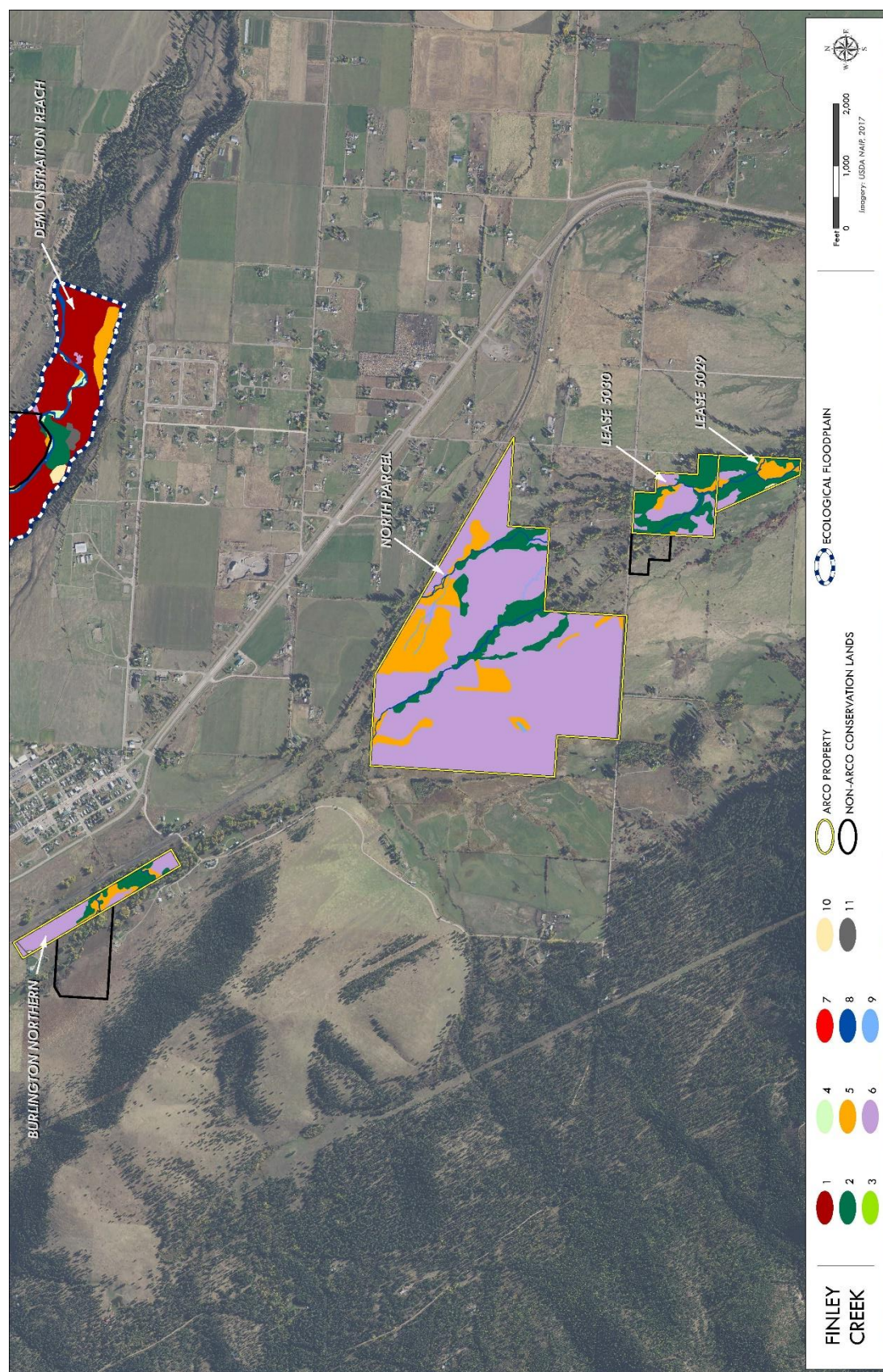


Figure B- 9. Overview of the Finley Creek LAA.

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## Wetland Assessment Area Figures

Figure B- 10. Overview of Lease 4515 WAA in LAA 2 of the Jocko River main stem.

Figure B- 11. Overview of the Bison Range WAA in LAA 2 of the Jocko River main stem.

Figure B- 12. Overview of the Cole WAA in LAA 2 of the Jocko River main stem.

Figure B- 13. Overview of the Eggert WAA in LAA 2 of the Jocko River main stem. \*\* Note only the red polygon labeled cover type 5 is the Eggert WAA, the other red polygons are part of the Cole WAA.

Figure B- 14. Overview of the Stranahan WAA in LAA 2 of the Jocko River main stem.

Figure B- 15. Overview of the Nicholson North WAA in LAA 3 of the Jocko River main stem.

Figure B- 16. Overview of the Nicholson South WAA in LAA 4 of the Jocko River main stem.

Figure B- 17. Overview of the Squeque WAA in LAA 4 of the Jocko River main stem.

Figure B- 18. Overview of the Schall Powell WAA in LAA 4 of the Jocko River main stem.

Figure B- 19. Overview of the Hatier WAA in LAA 5 of the Jocko River main stem.

Figure B- 20. Overview of the Lease 5022 WAA in LAA 5 of the Jocko River main stem.

Figure B- 21. Overview of the Clinkenbeard WAA in LAA 5 of the Jocko River main stem.

Figure B- 22. Overview of the Dumontier WAA in LAA 7 of the Jocko River main stem.

Figure B- 23. Overview of the Demonstration Reach WAA in LAA 2 of the Jocko River main stem.

Figure B- 24. Overview of the Lease 5768 WAA in North Fork Jocko River LAA.

Figure B- 25. Overview of the North Valley Creek WAA and LAA.

Figure B- 26. Overview of the Lease Jefferson WAA and LAA, located along Jocko Spring Creek.

Figure B- 27. Overview of the North Parcel WAA in the Finley Creek LAA.

Figure B- 28. Overview of the Leases 5029 and 5030 WAA in the Finley Creek LAA.

Figure B- 29. Overview of the Burlington Northern WAA in the Finley Creek LAA.



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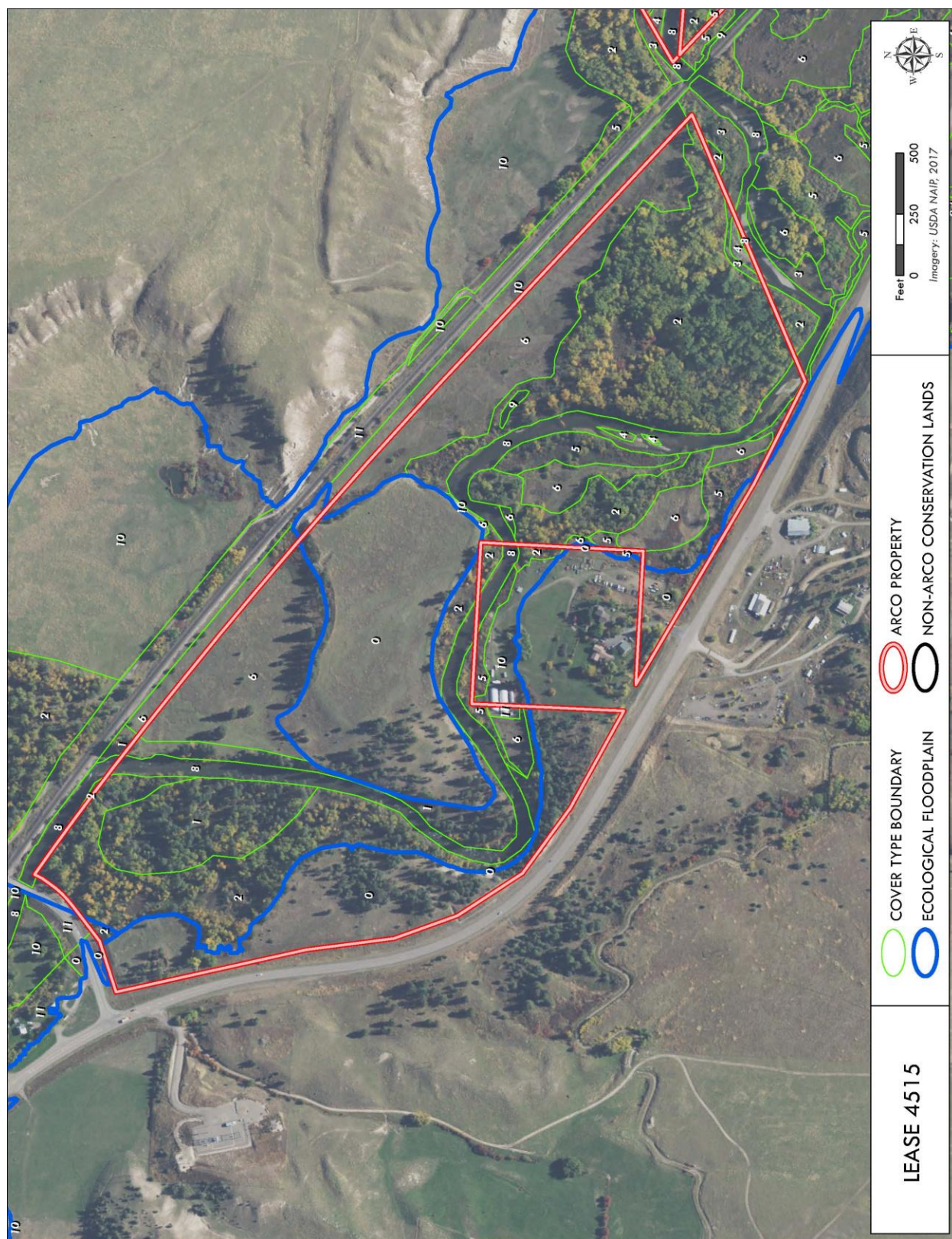


Figure B- 10. Overview of Lease 4515 WAA in LAA 2 of the Jocko River main stem.



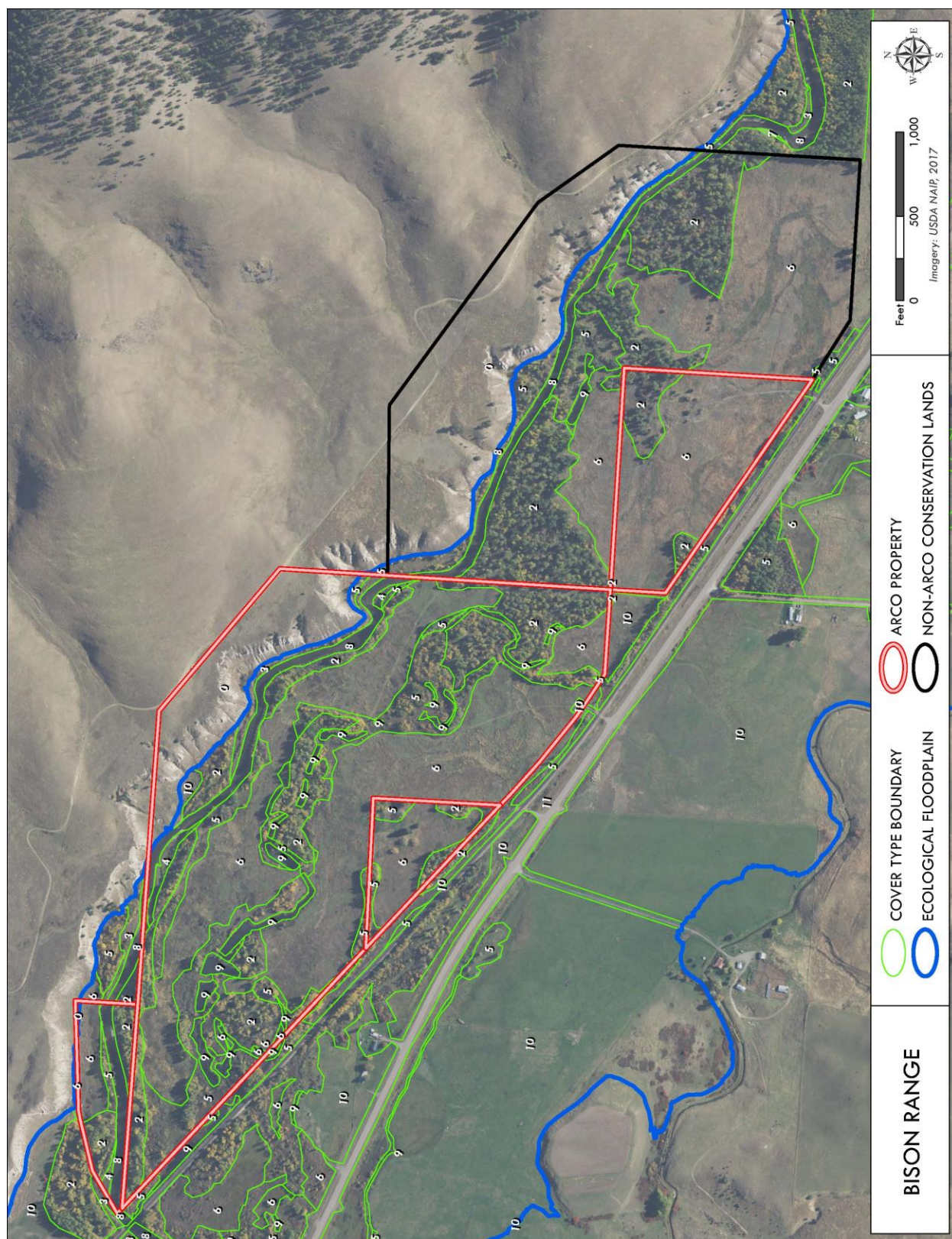


Figure B- 11. Overview of the Bison Range WAA in LAA 2 of the Jocko River main stem.



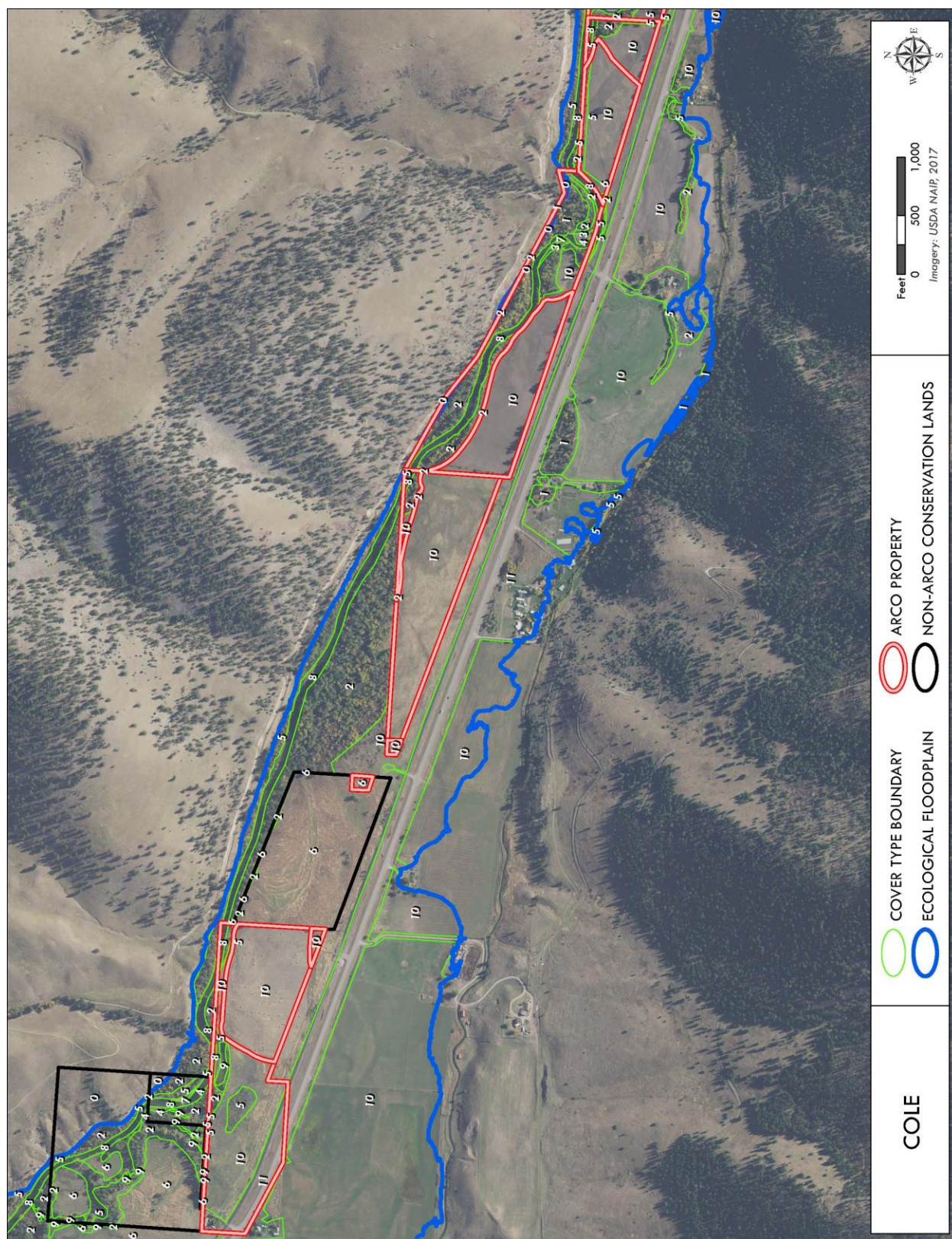


Figure B- 12. Overview of the Cole WAA in LAA 2 of the Jocko River main stem.



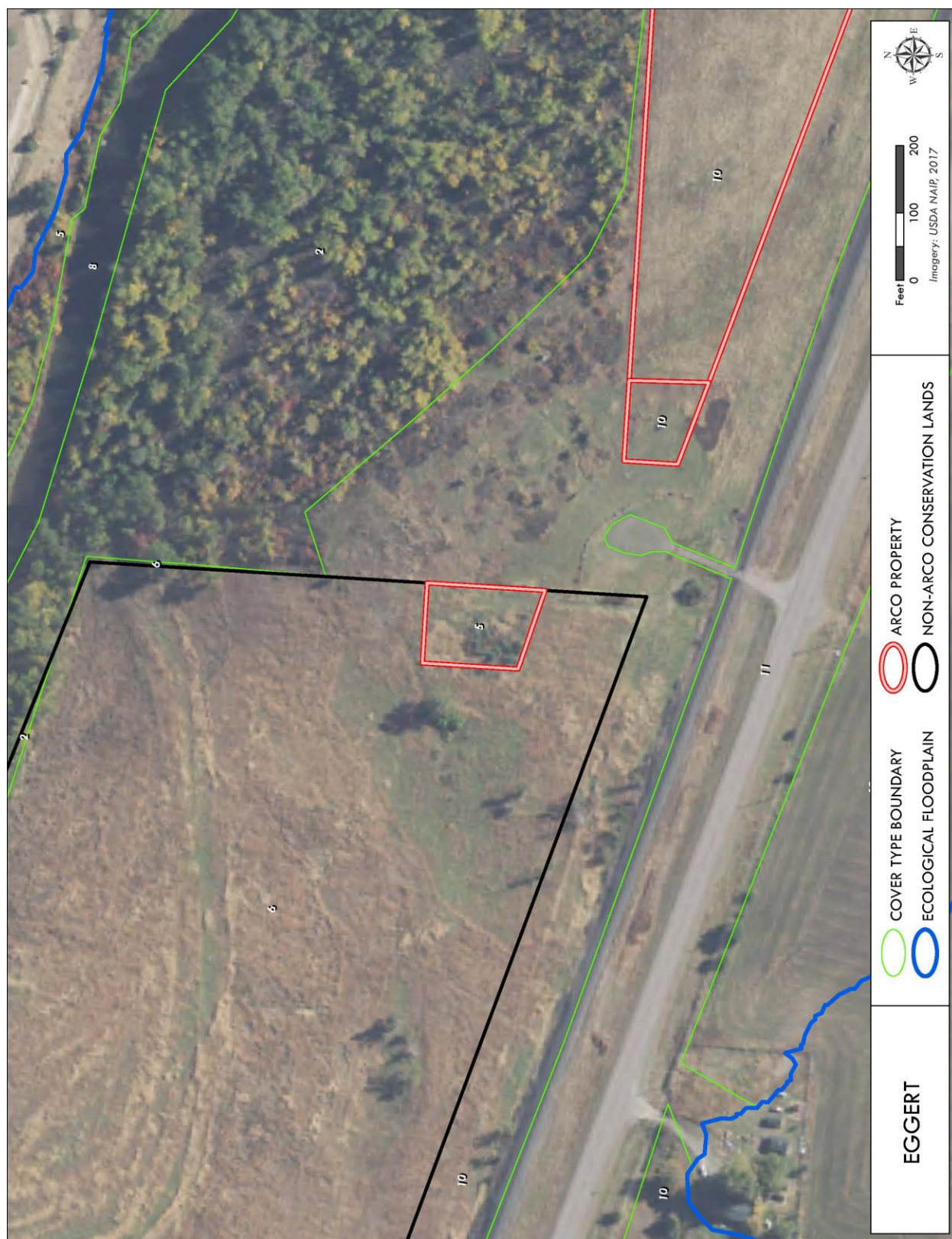


Figure B- 13. Overview of the Eggert WAA in LAA 2 of the Jocko River main stem. \*\* Note only the red polygon labeled cover type 5 is the Eggert WAA, the other red polygons are part of the Cole WAA.



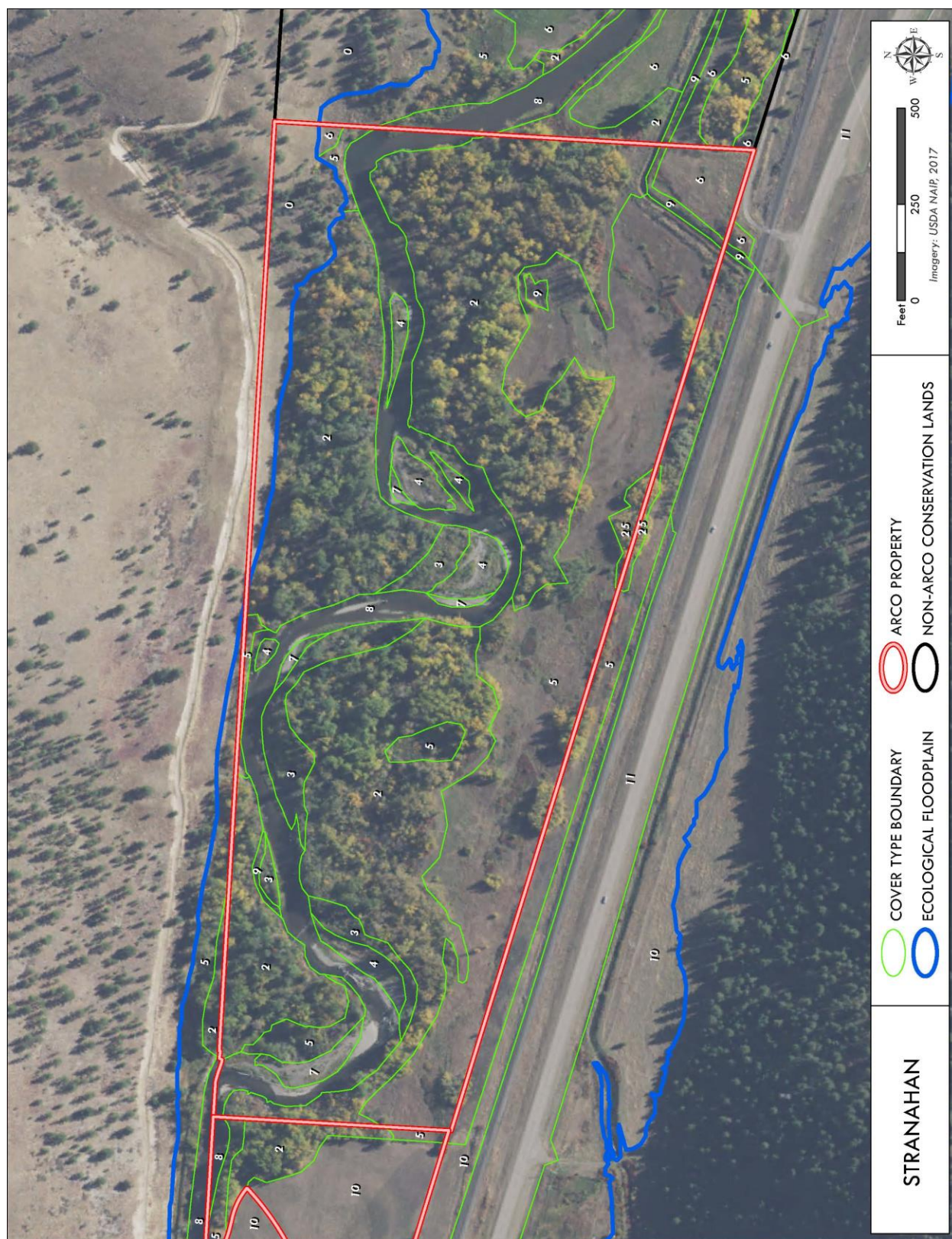


Figure B- 14. Overview of the Stranahan WAA in LAA 2 of the Jocko River main stem.



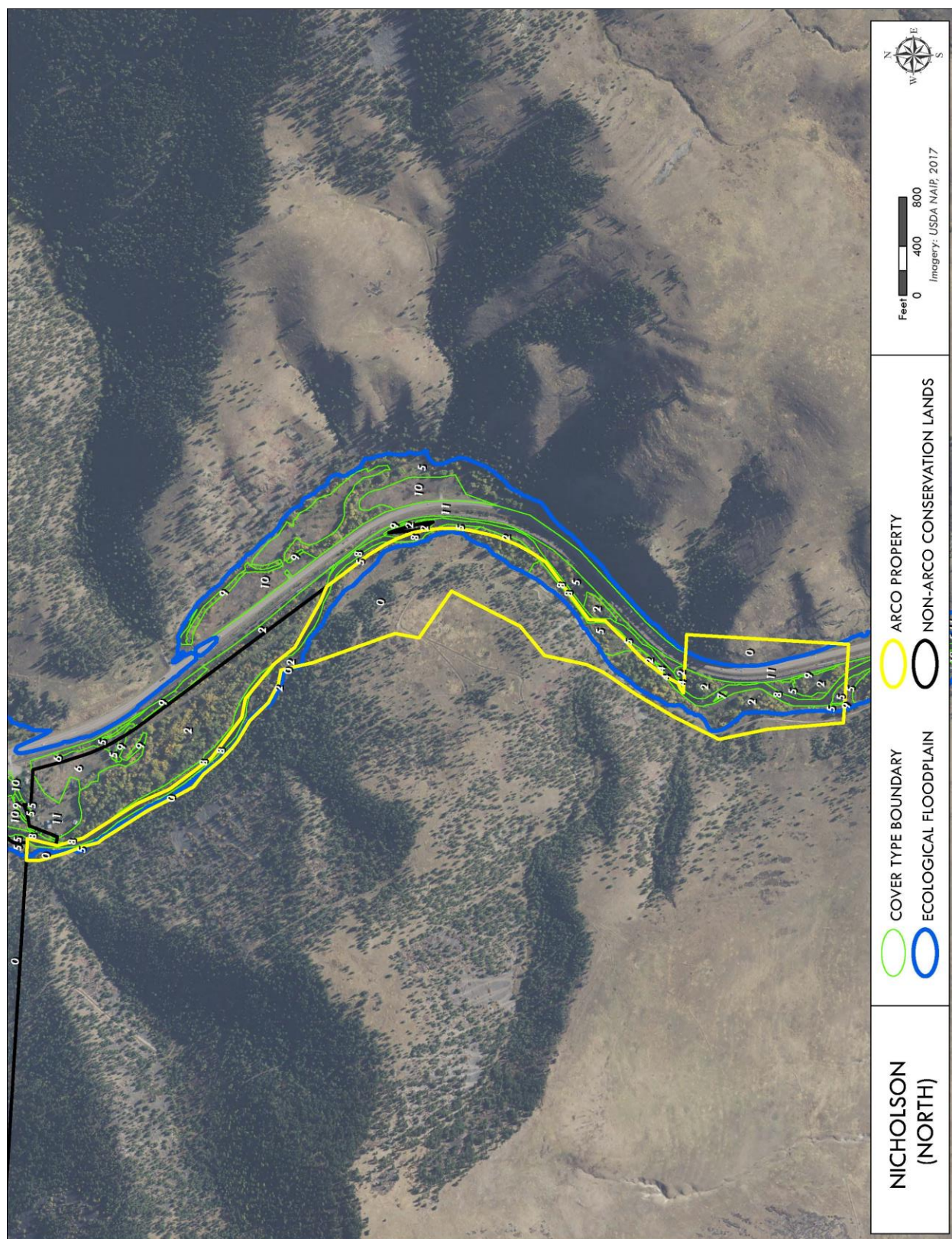


Figure B- 15. Overview of the Nicholson North WAA in LAA 3 of the Jocko River main stem.



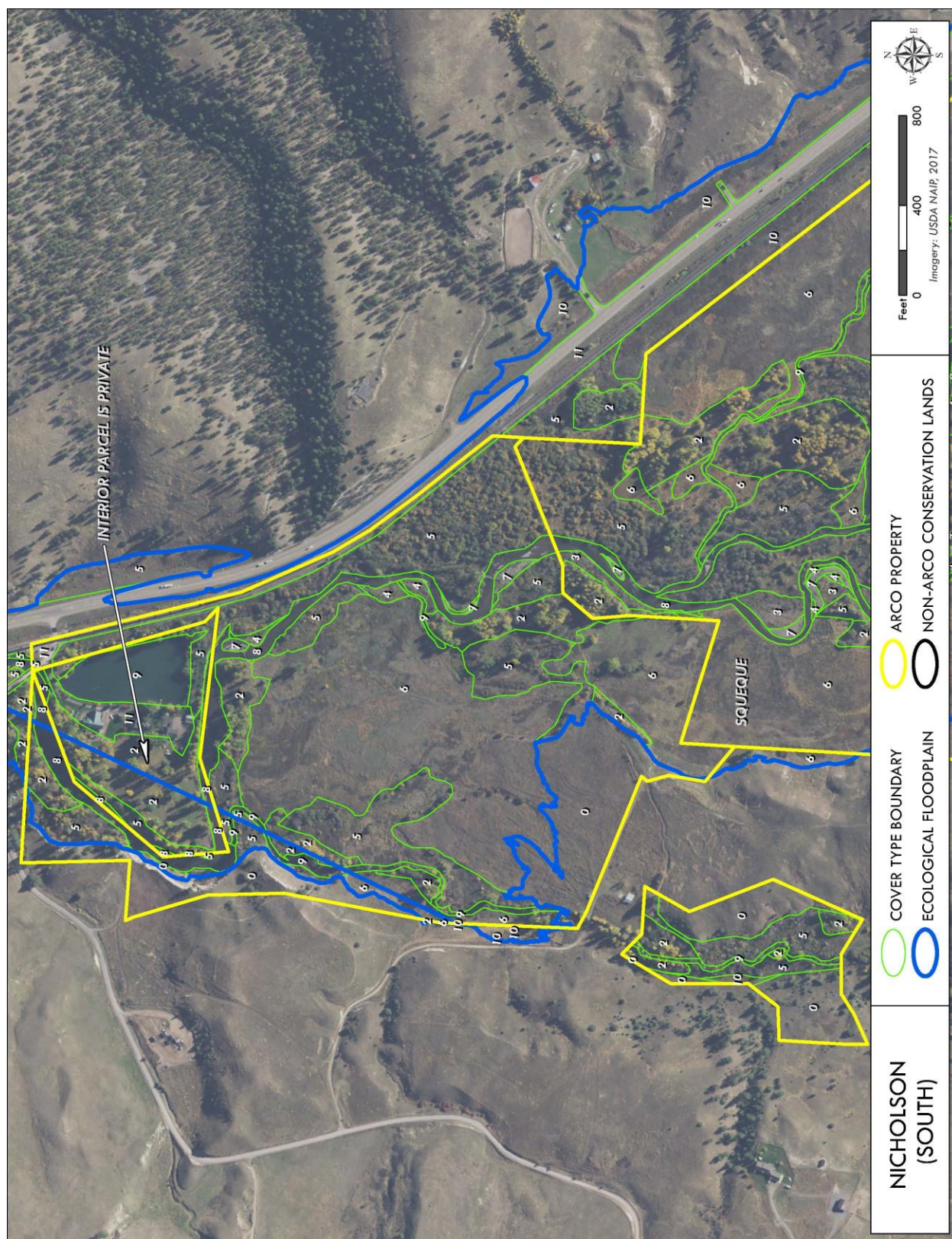


Figure B- 16. Overview of the Nicholson South WAA in LAA 4 of the Jocko River main stem.



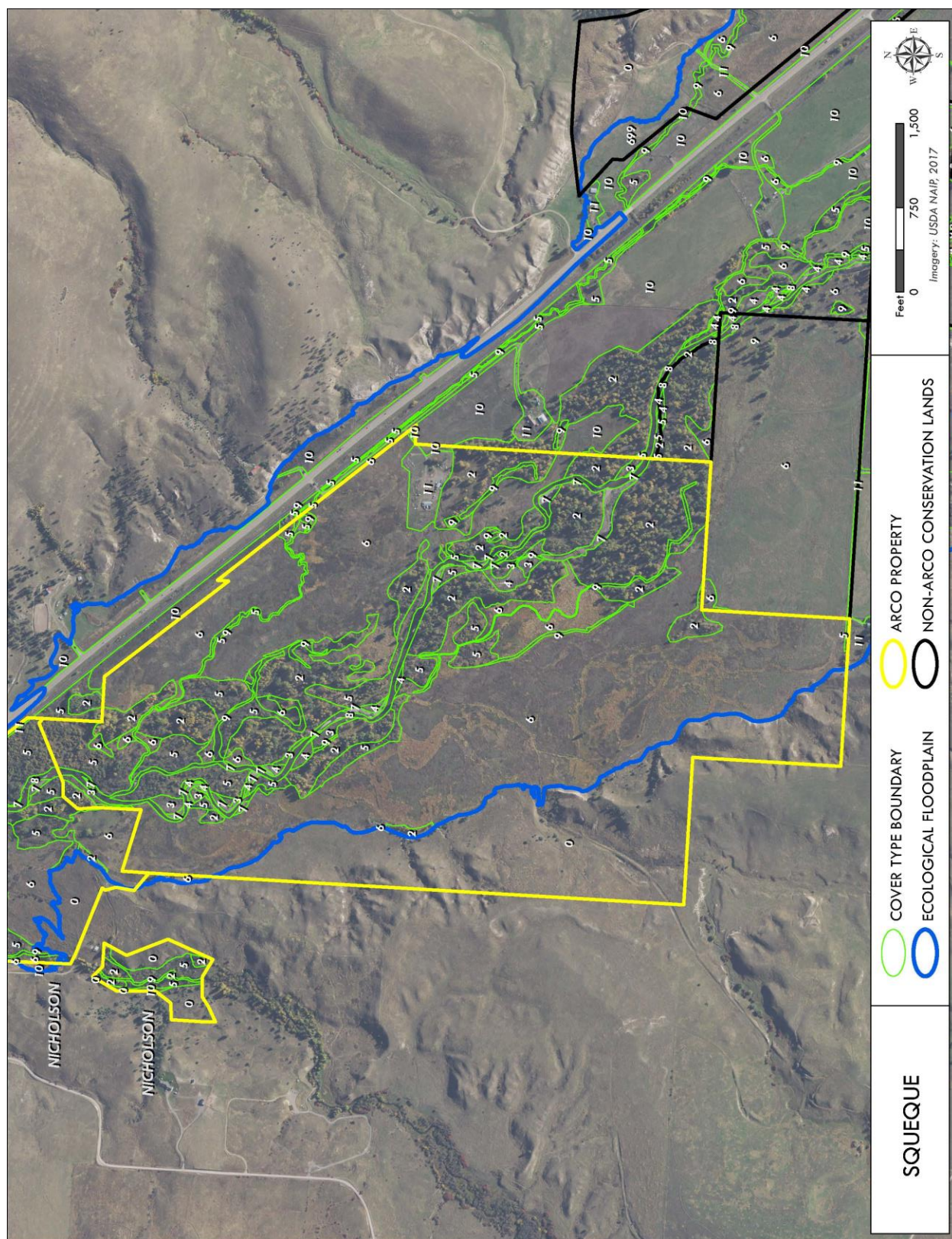


Figure B- 17. Overview of the Squeque WAA in LAA 4 of the Jocko River main stem.



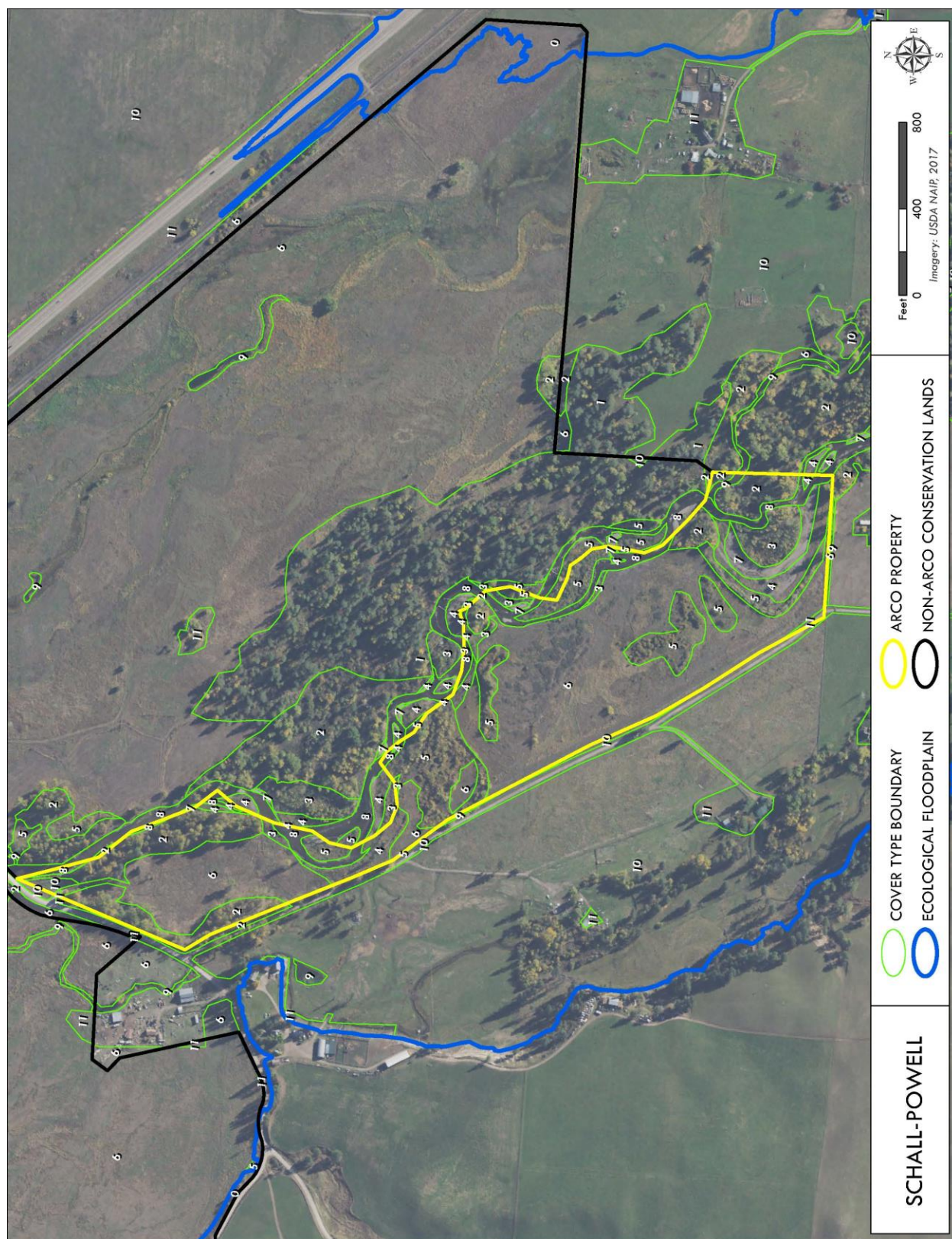


Figure B- 18. Overview of the Schall Powell WAA in LAA 4 of the Jocko River main stem.



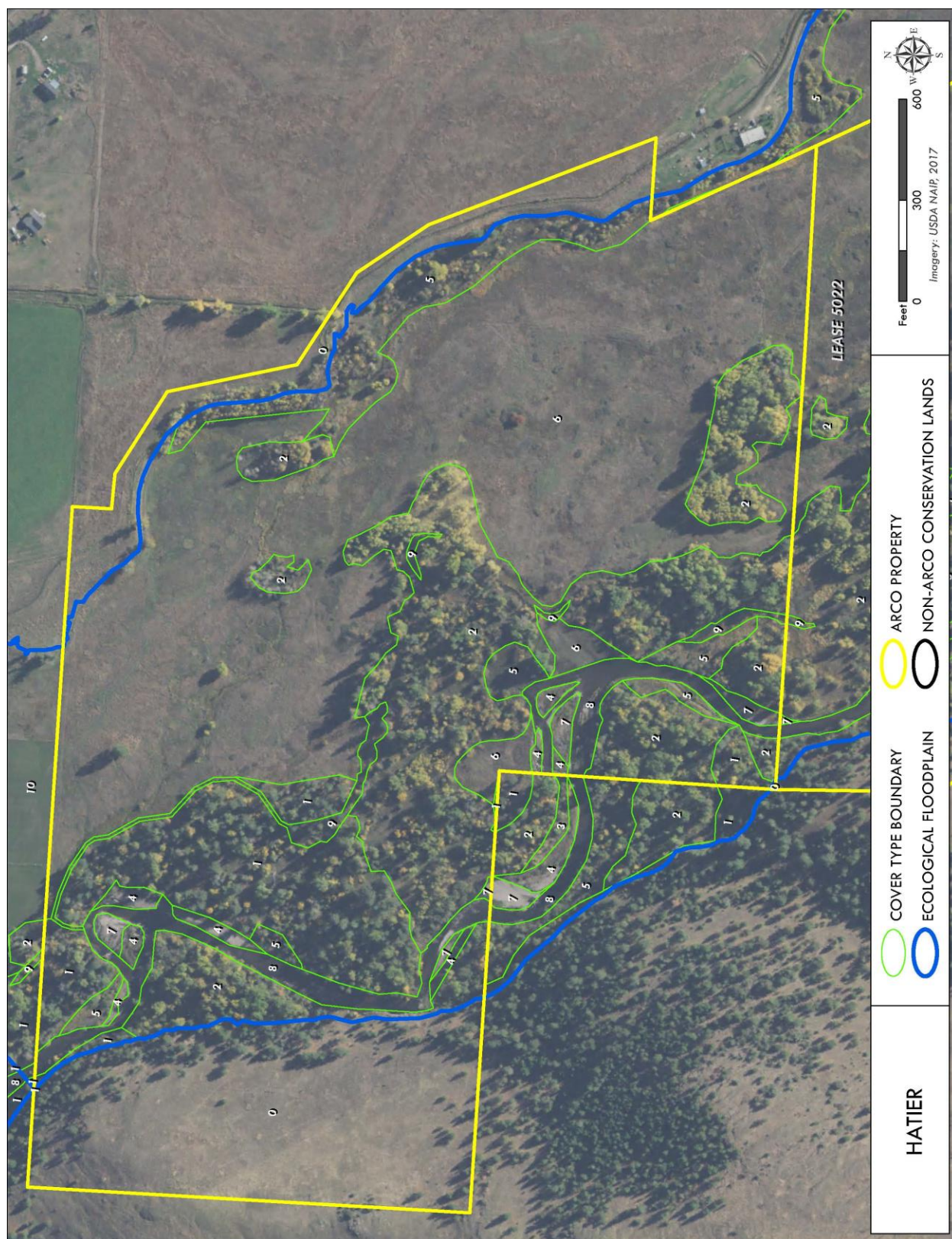


Figure B- 19. Overview of the Hatier WAA in LA 5 of the Jocko River main stem.



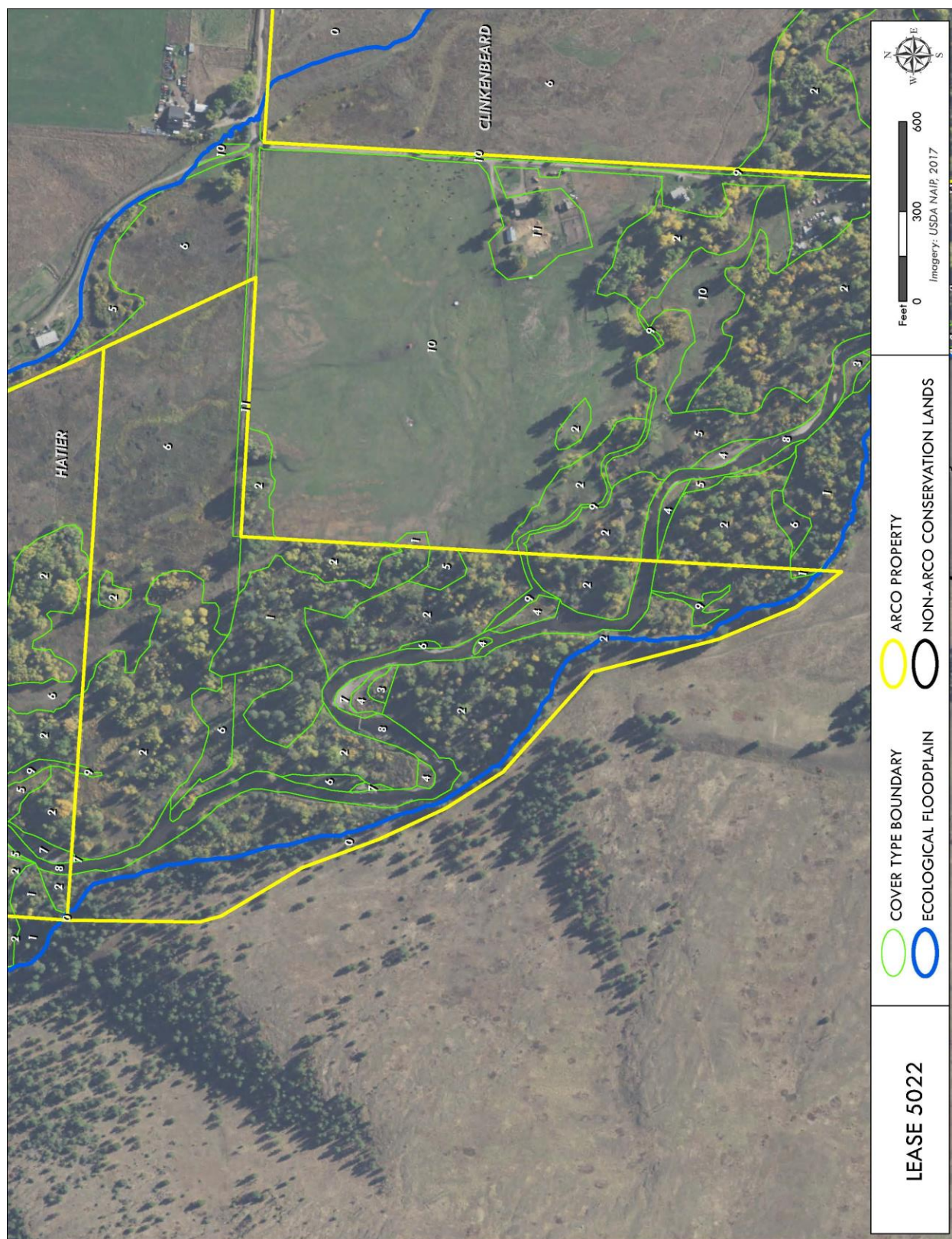


Figure B- 20. Overview of the Lease 5022 WAA in LAA 5 of the Jocko River main stem.



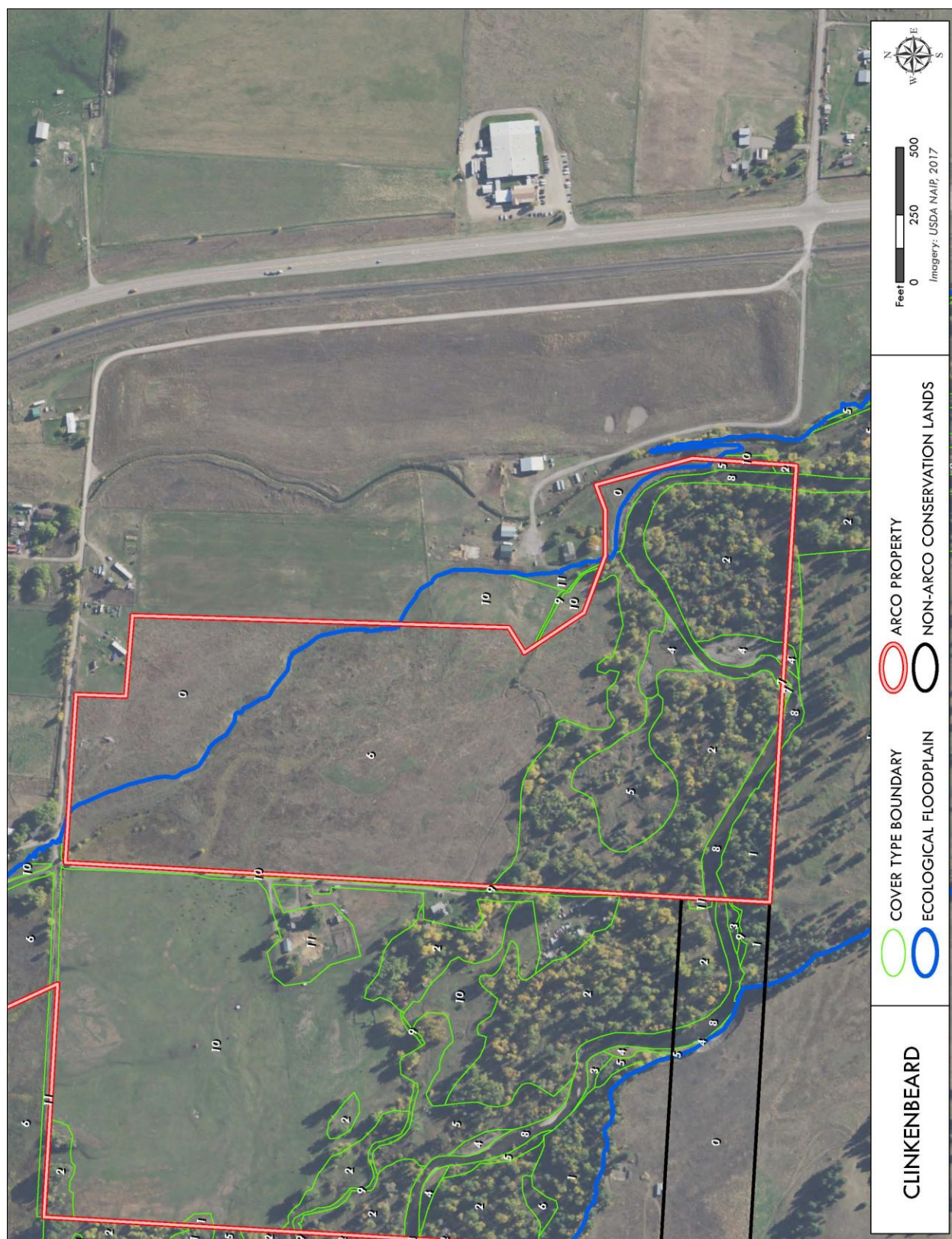


Figure B- 21. Overview of the Clinkenbeard WAA in LAA 5 of the Jocko River main stem.



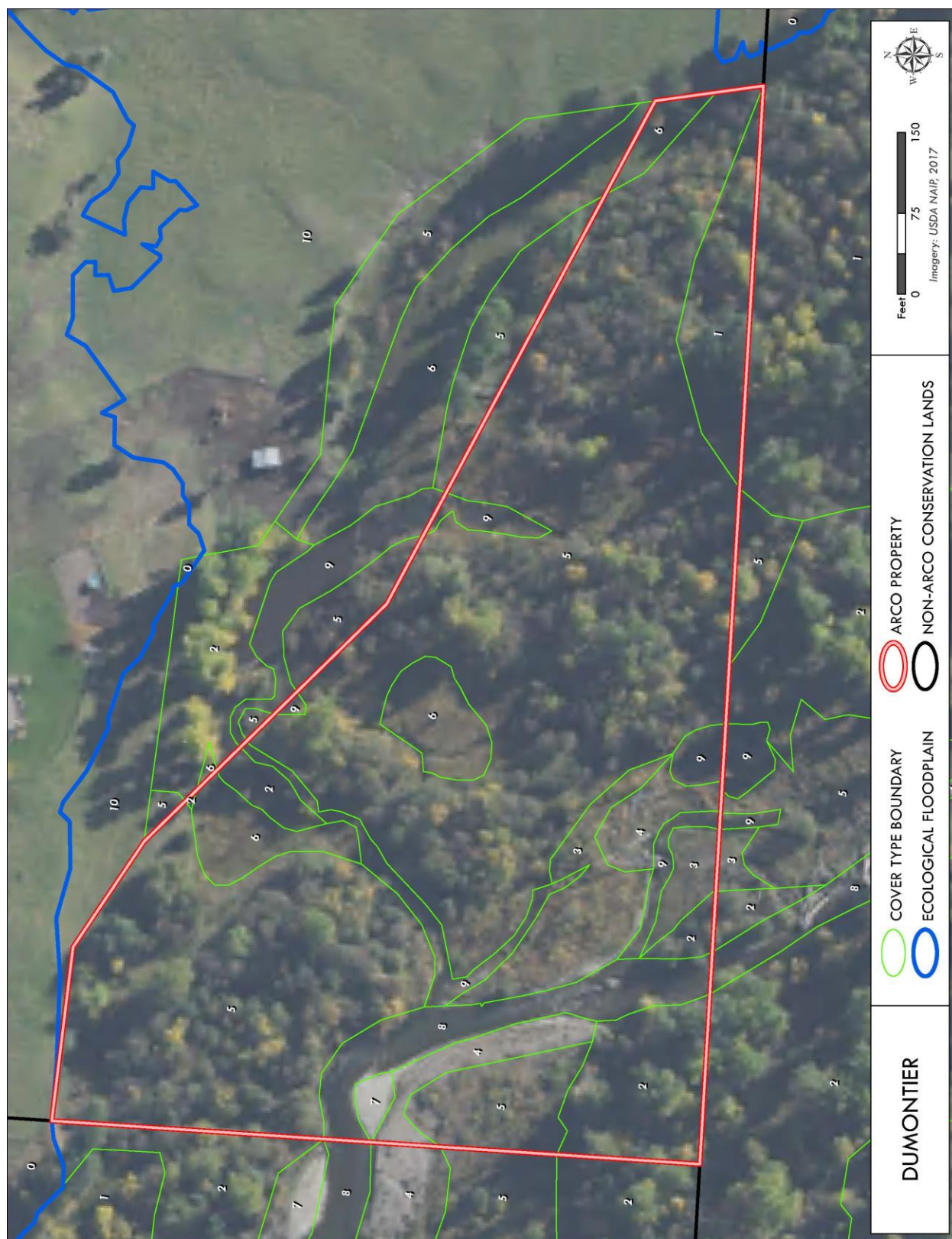


Figure B- 22. Overview of the Dumontier WAA in LAA 7 of the Jocko River main stem.



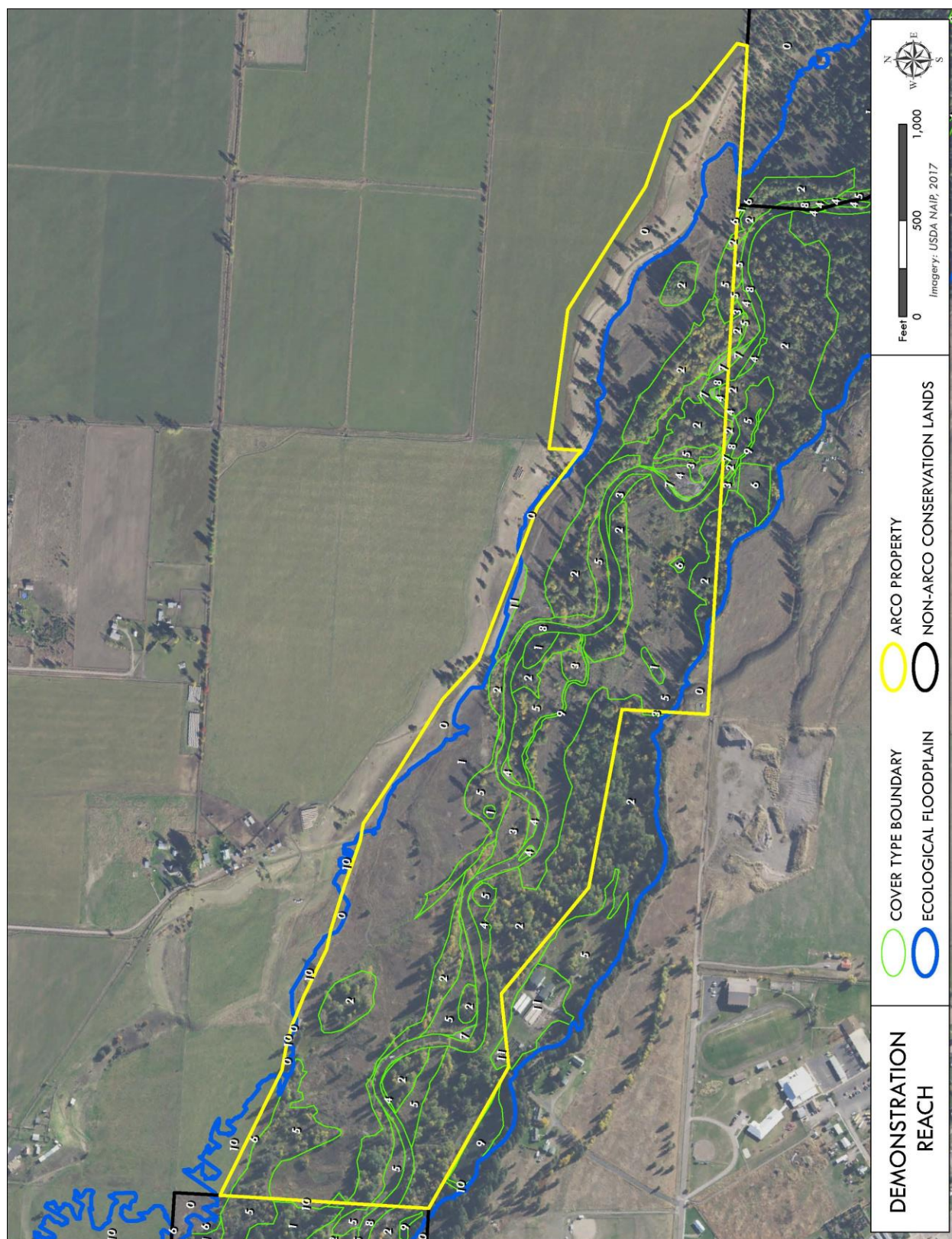


Figure B- 23. Overview of the Demonstration Reach WAA in LAA 2 of the Jocko River main stem.



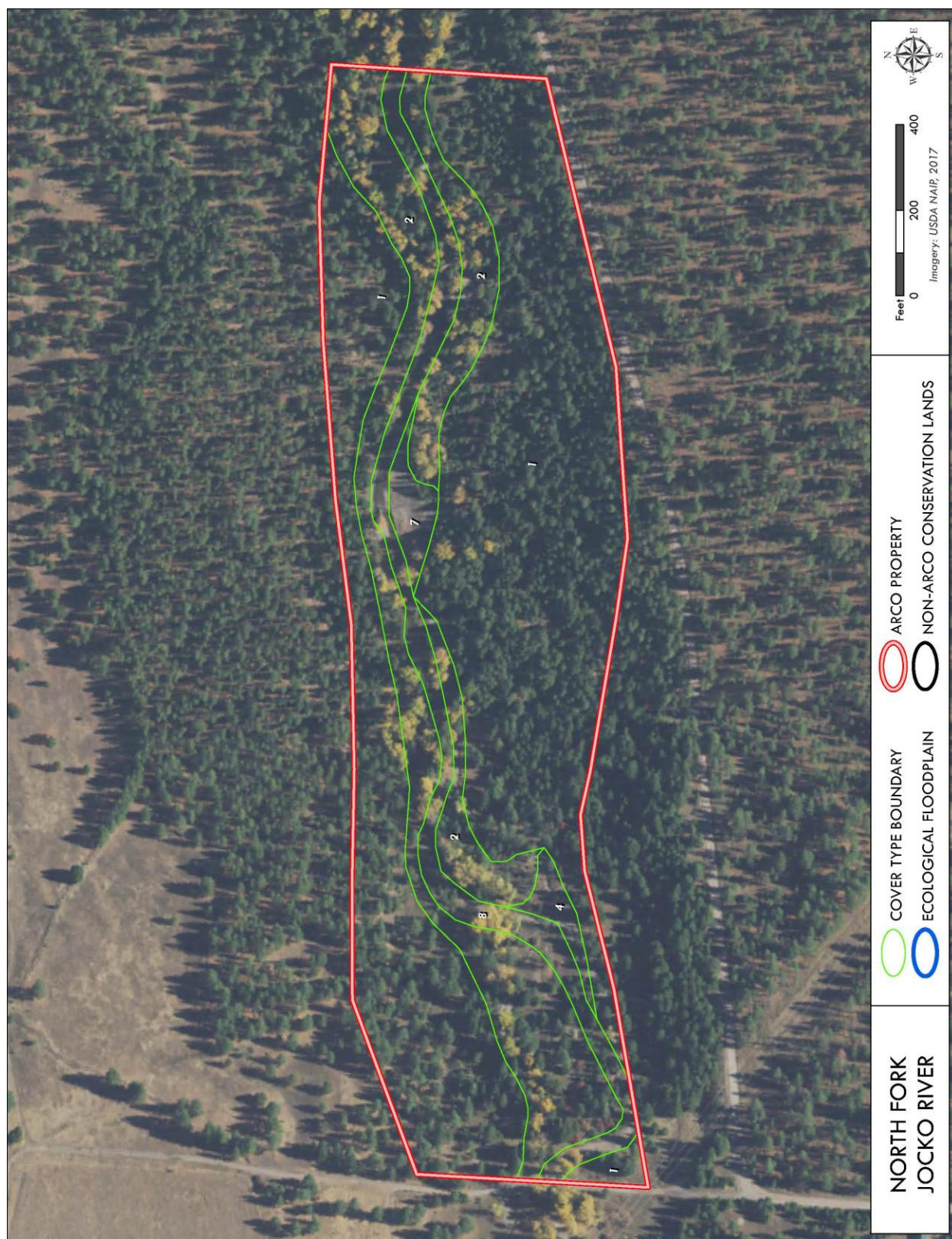


Figure B- 24. Overview of the Lease 5768 WAA in North Fork Jocko River LAA.



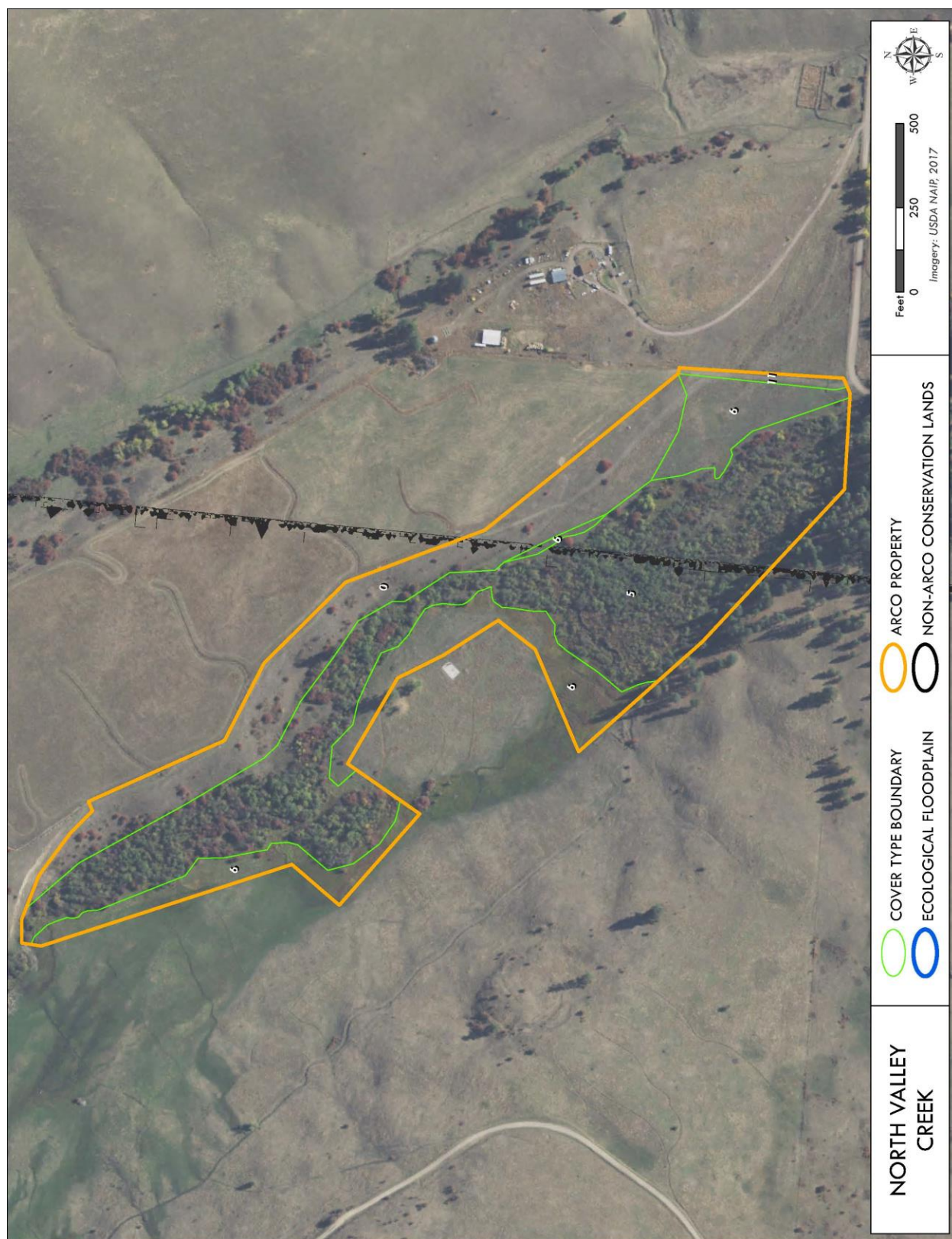


Figure B- 25. Overview of the North Valley Creek WAA and LAA.



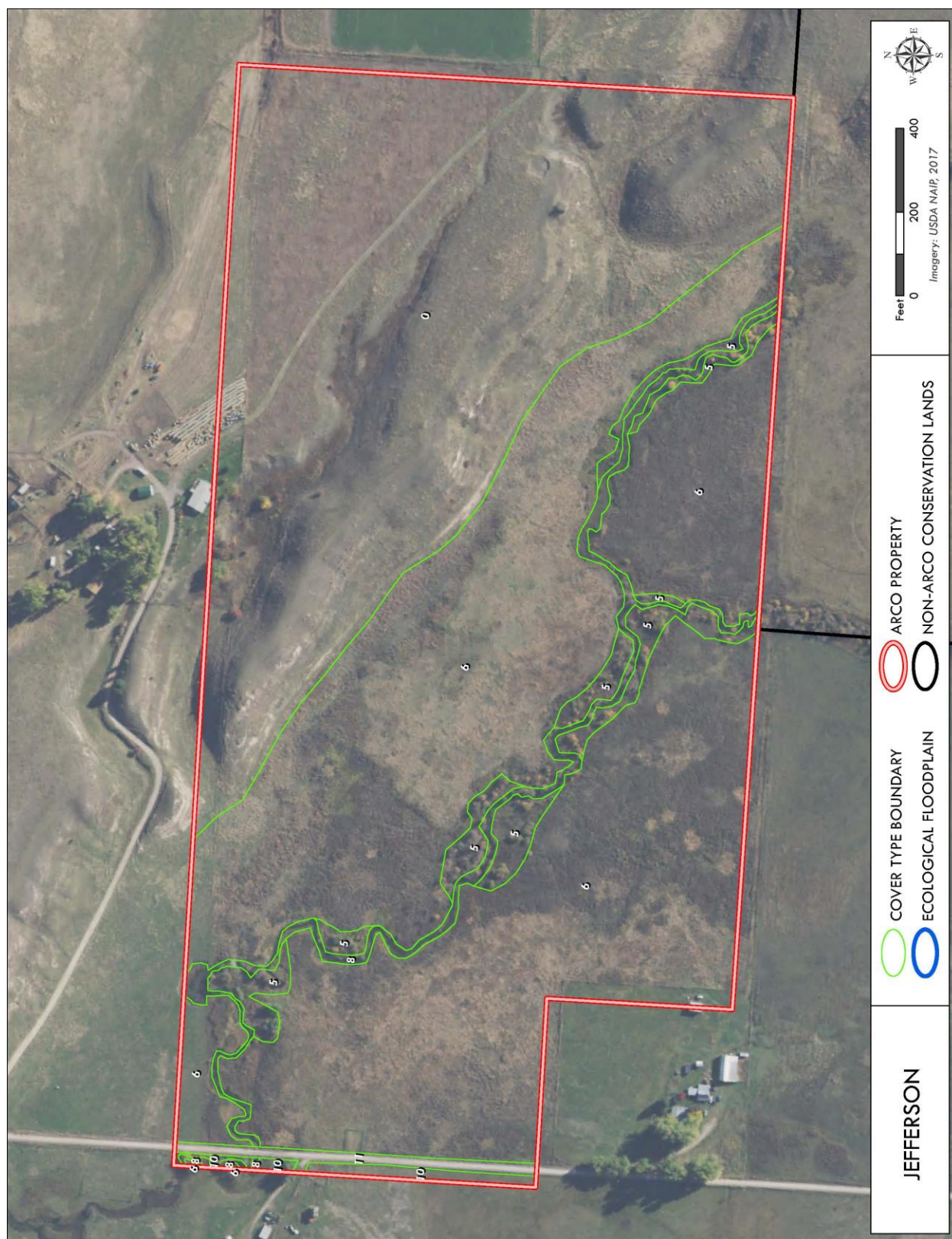


Figure B- 26. Overview of the Lease Jefferson WAA and LAA, located along Jocko Spring Creek.



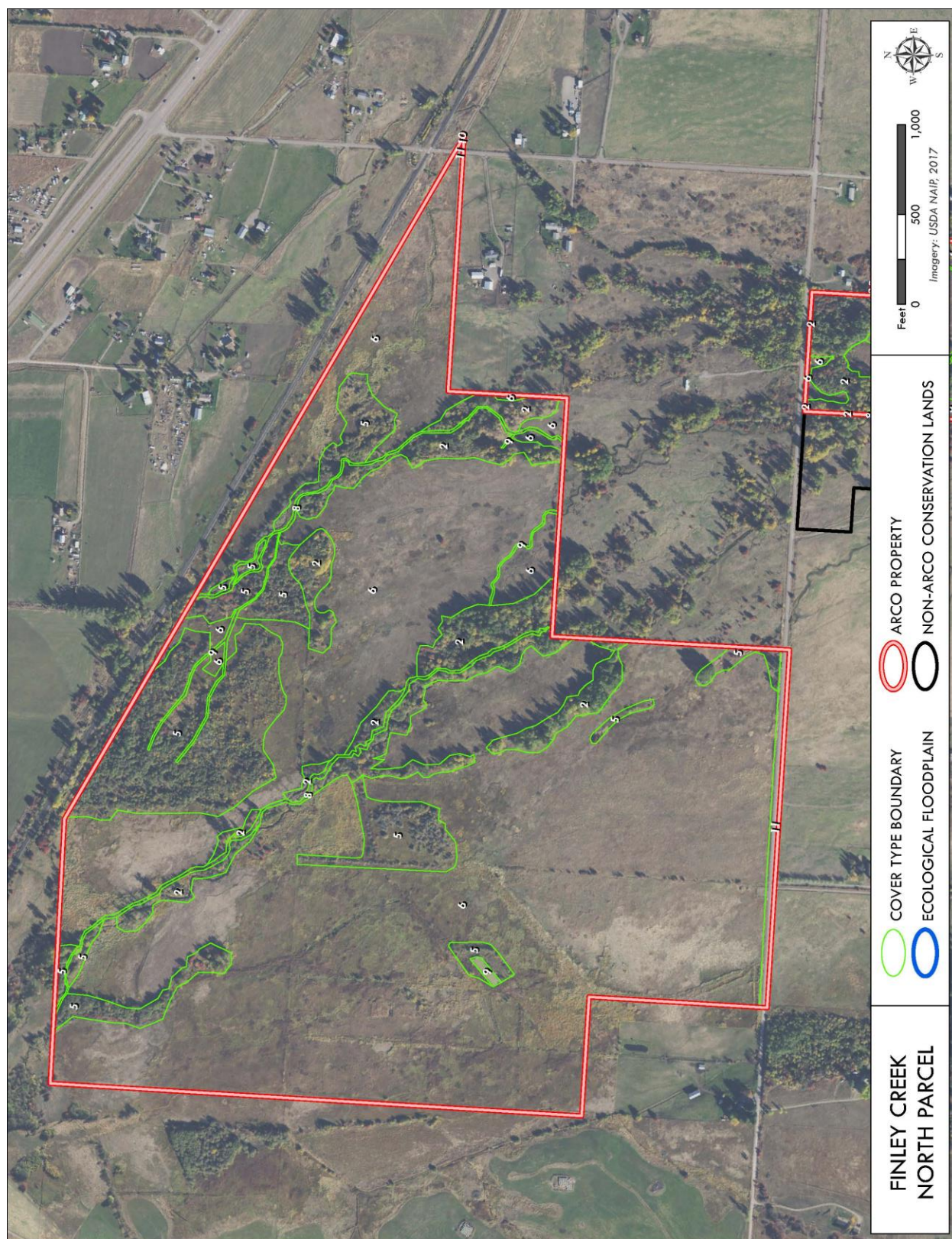


Figure B- 27. Overview of the North Parcel WAA in the Finley Creek LAA.



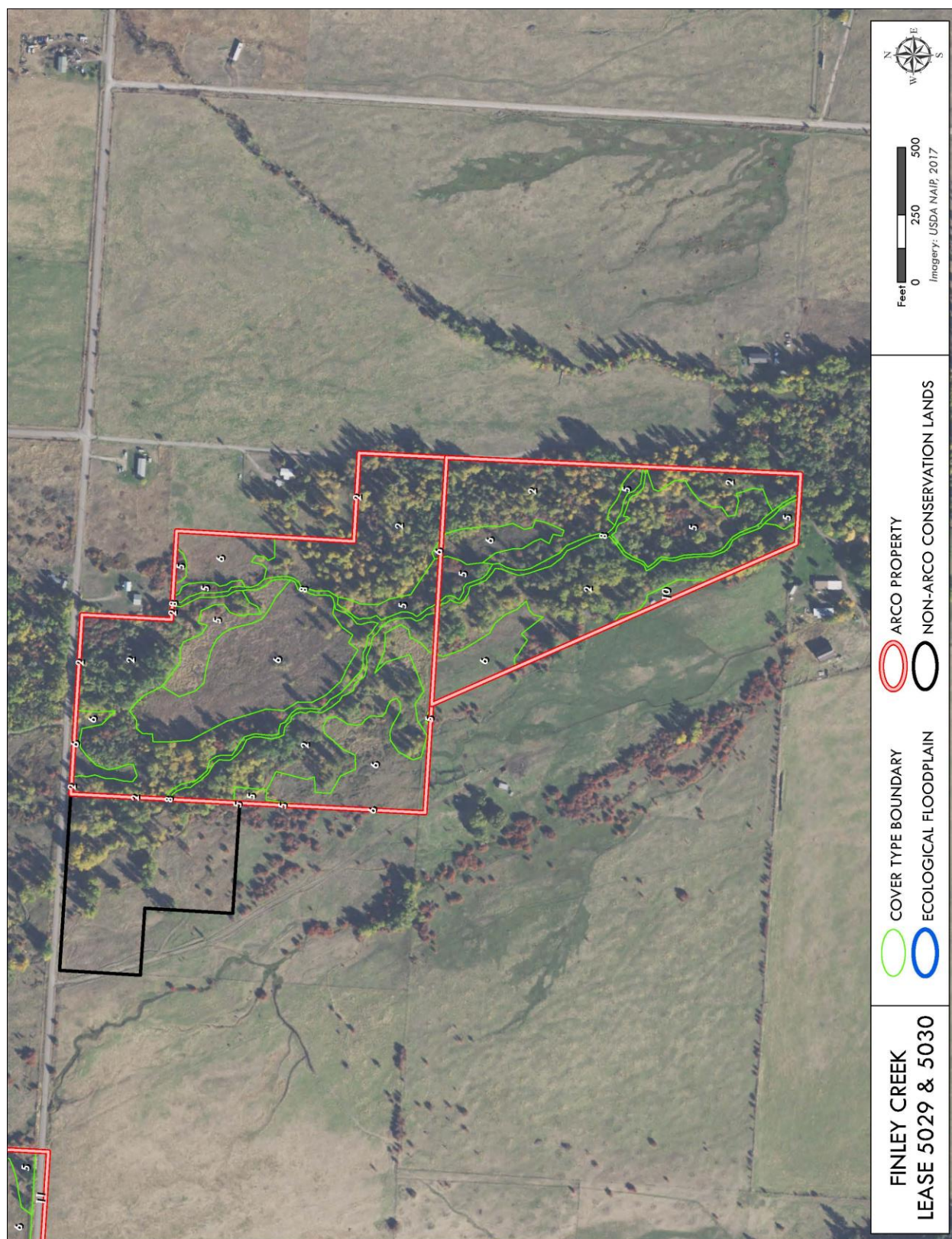


Figure B- 28. Overview of the Leases 5029 and 5030 WAA in the Finley Creek LAA.



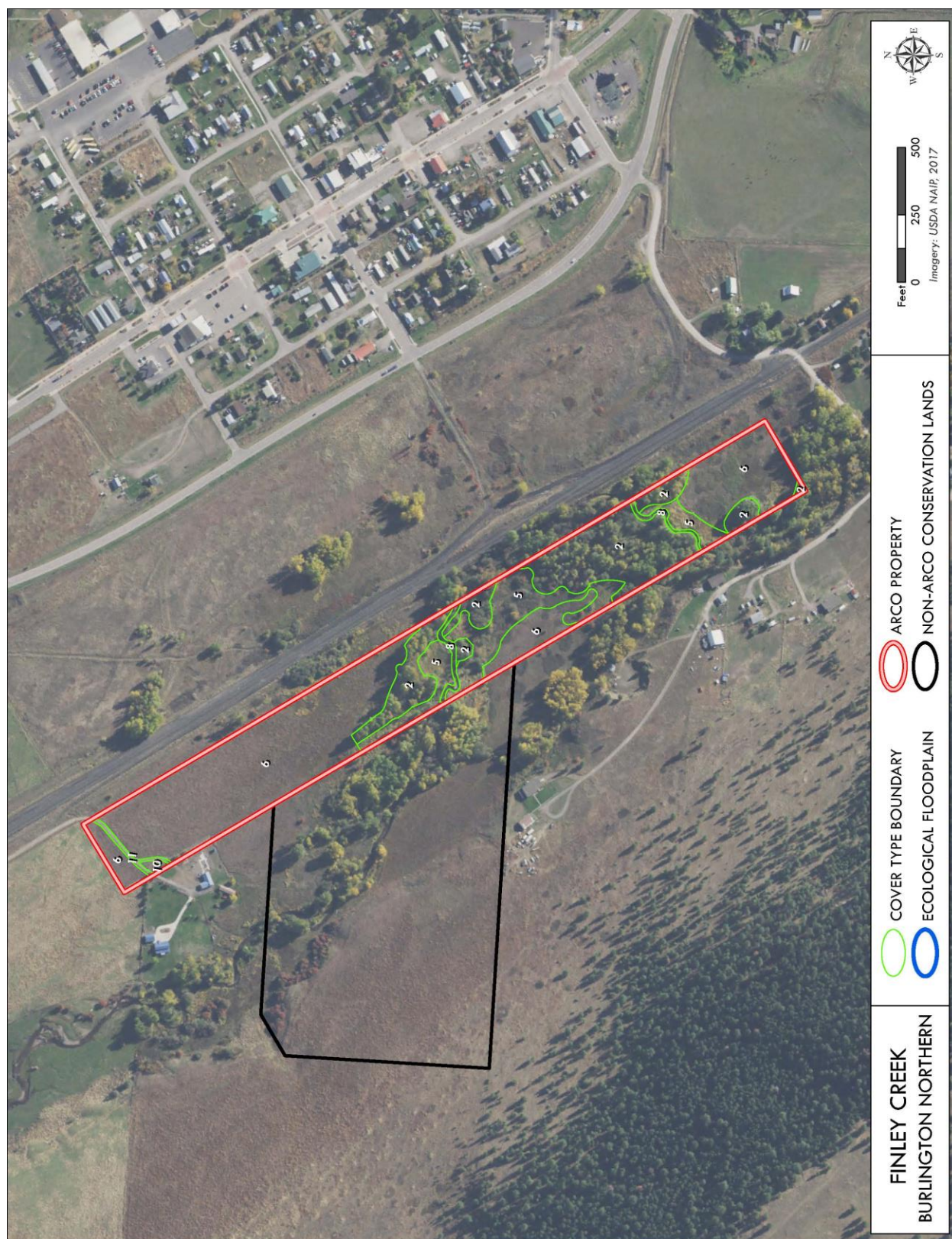


Figure B- 29. Overview of the Burlington Northern WAA in the Finley Creek LAA.