Antelope Creek Habitat Development Area

Summer Range Technician Report 2017

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Introduction

Antelope Creek is a 5,500 acre research ranch located in the dry mixedgrass prairie 16km west of Brooks, Alberta. Established in 1986, the ranch was purchased through a partnership between the Alberta Fish and Game Association (AFGA), Ducks Unlimited (DU), Alberta Environment and Parks (AEP), and Wildlife Habitat Canada (WHC), and is managed by Neal Wilson and Shannon Burnard. It was formerly a part of the Ward ranch, during which time dry ditches and flood irrigation cells were installed, making the ranch a combination of native grassland pastures, and tame, irrigated pastures. As a research ranch, the main goal of Antelope Creek is to demonstrate how a ranch can successfully incorporate tame and native grassland grazing, wildlife, oil and gas, and research to maintain a healthy and profitable rangeland property.

To this end, summer range technicians are hired and trained to catalogue the plant communities of the native grassland pasture, and document the extent of disturbance from man-made development. Ranch management then uses these evaluations to calculate the carrying capacity of each pasture for optimal grazing management and ecological function.

The range inventory process, from pre- to post-field activities, takes approximately two months, and is planned to occur when the plants are vegetative and easily identifiable. In the remaining summer months, range technicians perform a variety of other duties, from checking fences and rounding up cattle to hand-weeding and clipping biomass from range cages.

Monthly Activity Summaries

May

The month of May was spent getting oriented around the ranch and the Lethbridge AEP office, and getting the ranch ready for the arrival of cattle. Along with the ranch manager Neal Wilson, we checked fence lines, repaired breakages, finished installing a smooth bottom wire in the irrigation pivot paddocks, replaced broken posts and gates, and rolled wire and pulled posts from old sections of fence that had been eliminated or replaced. We also cleaned out the barn and trained with the horses we would be using to round up and move the cattle once they arrived in June. We prepared the irrigation canals and ditches to transport water to the cattle, which involved hiring and supervising heavy equipment operators to remove beaver dams and repair holes created in canal walls, and areas where the walls of dry ditches had been worn down. I also moved the range cages in fields 1, 3, and Cassils field before the cattle arrived, to avoid resampling of areas that were clipped during 2016. Cattle arrived on the weekend of May 20, 2017, and fences, water, and cattle health were frequently checked thereafter.

June

Similarly, in June time was spent checking on the health of the cattle as they adjusted to their surroundings, placing salt blocks for them, moving them between paddocks on horseback, and checking that they had an ample and steady water supply. Fence checks were regularly performed, and fence repairs were completed in several fields before the cattle were moved there. Contractor training with AEP and MULTISAR took place in Pincher Creek and Manyberries, AB, over June 5-6, 2017, and quad training took place in Lethbridge on June 9, 2017. One day was spent hand-picking downy brome grass (*Bromus tectorum*, or cheatgrass) around oil and gas lease sites in native grass fields. The hand-picking by summer range technicians, ranch management, and Cenovus staff in former years was highly successful, as the invasive grass was now confined to small patches around a former lease site in field 2, and a current lease site in field 3. Range inventory of field 4 began on June 16, 2017, with supervision and guidance from Tanner Broadbent, Amanda J Miller, and Ross Adams, and continued until August 5, 2017. Range inventory methods and results will be discussed later in this report.

July

The entire month of July was devoted to range inventory in field 4.

August

August 3 and 4 were spent in Lethbridge, preparing polygon maps using ArcMap, and training in AEP's EcoSys database for recording transect data. An extra day was spent inventorying small, disturbance-related polygons to complete inventory coverage of field 4. The week of August 7, 2017 was spent entering data, and another week was spent compiling data and generating this report. Forage production clipping of enclosures and range cages took place from August 14-18, 2017.

Clipping

Each of the four native fields has one permanent grazing enclosure within it, established in the 1980s, along with 10 range cages that are moved before every grazing season (only 9 cages were found in Cassils field this year). The purpose of clipping is to measure annual biomass productivity, and the effects of climatic variability and grazing on biomass production, and has been performed on Antelope Creek Ranch since 1988. Cassils field has cages only, and no permanent enclosure. Field 4 has an additional 6 cages in the northeast corner, as productivity is greatly varied in this field. For this year, however, only the 10 cages around the main enclosure were clipped.

Range Inventory Methods

Range inventory and rangeland health assessment training were provided by AEP and MULTISAR in early June, and range inventory began on June 16, 2017. Tanner Broadbent, Ross Adams, and Amanda J Miller provided guidance in the range inventory process during visits in June and July.

The range inventory protocol used at Antelope Creek Ranch (ACR) differs from the standard inventory protocol used by AEP contractors in that all polygons are assessed for plant community composition and range health using detailed transects of 10 microplots along a 50 meter transect, and visual and reconnaissance assessments are discouraged. By contrast, AEP contractors make use of reconnaissance and visual plots in addition to detailed transects of 15 microplots along a 30 metre transect to map plant communities of the inventory area. The AEP Range Inventory Manual is updated annually, and can be consulted for a more detailed description of the AEP inventory taking process.

At Antelope Creek Ranch, each native grassland field has been assigned a series of map units, or polygons, in decile form, based on the Grassland Vegetation Inventory (GVI) and on aerial photos taken in 2012 and 2013. The abbreviations “Lo”, “BlO”, “Sb” and others indicate the ecological range site type that can be inferred to exist below-ground based on soil mapping and topographic interpretation of the landbase. If a polygon is labelled 60Lo-35BlO-05Sb, the polygon would be composed of 60% Loamy, 35% Blowout, and 5% Sub-irrigated range sites, each of which may express distinct plant communities. The task of the ACR summer range technician is to locate the Loamy, Blowout, and Sub-irrigated ecosites, identify each plant community within them, and map the boundaries between these communities. The technician must then report on whether the decile percentages for the GVI polygon ecosites are accurate, based on their observations in the field. The goal of the research at ACR is therefore to confirm or advise changes to the general GVI polygons, as well as to further subdivide them into their component plant communities, and to map out the boundaries of those communities. Each community has a different Ecologically Sustainable Stocking Rate (ESSR), measured in Animal Unit Months per acre (AUM/ac), which indicates the maximum forage consumption per acre that a plant community can support, while still maintaining proper ecological function. When this number is applied to the total area of a polygon, and adjusted for the health of that polygon, it is termed that polygon’s carrying capacity, and can be used by the range manager to make decisions about the unit under management. It is important to ground-truth the GVI polygons in this way to ensure that the plant communities are labelled correctly, and in the correct proportions, so that the range manager can more precisely plan the grazing of their property and maintain its health. Native fields 2, 3, and Cassils field have been inventoried in previous summers by technicians Ross Adams and Mica Pettibone. This report focuses on the inventory of native field 4.

Plant community boundaries were identified first and drawn onto the GVI polygon map. This identification was completed visually, while consulting the Government of Alberta’s Range Plant Communities and Range Health Assessment Guidelines for the Dry Mixedgrass Natural Subregion of Alberta. A 50m transect was then taken of a representative area inside each polygon, to identify the plant community to which it belonged. Transects were run horizontally across slopes, and not down them, and if they were documenting a Blowout ecosite, were placed in such a way as to capture both the high and low areas of the Blowouts. A 20x50cm Daubenmire frame was placed along the transect at 5m intervals, 10 frames total, and the vegetation inside was documented on a 2016 MF5 Range Inventory Form. There was a one-week period during which the Daubenmire frame was lost, and the dimensions were approximated by using a 50cm x 50m frame, and delineating the 20cm mark with a piece of baling twine.

Once the plant community and reference plant community (RPC) were identified for a polygon, the health of that polygon was assessed by comparing it to the RPC and filling out the Grassland Range Health Assessment Score Sheet. In many cases the plant community identified in the transect was the RPC, but in some cases it was identified as a community successional to an RPC, due to changes in precipitation, disturbance, overgrazing, or soil development. Disturbances and linear features were identified next, and indicated on the map. This included patches of Crested Wheat Grass (CWG, or *Agropyron pectiniforme*) or other agronomic plant species near culverts and dam walls, well sites, pipelines, roads and trails, canals and dry ditches. Agronomic disturbances greater than 1 ha were mapped and treated as polygons – with transects and health assessments – and those under 1 ha were given a range health assessment, and included as a decile within the larger polygon in which they were located. Nearly all of the disturbances greater than 1 ha were patches of CWG that had been mapped previously. Because these disturbances were being managed in the same fashion as the surrounding native grasses, the native grassland health form was used to assess the health of the CWG patches. Pipelines were treated in a similar fashion, and were assessed using native range health assessments. Man-made, linear features such as fences, roads, truck trails visible on the GVI map, dry ditches and canals were all treated as polygon boundaries. They did not receive transects or range health assessments because they are abrupt, man-made transitions between sites and too small and narrow to be assessed and mapped as separate units. If, however, the agronomic plant species had spread beyond these linear features, into the surrounding native grassland, these were mapped and either treated as polygons or deciled out within the larger polygon to which they belonged, depending on the size of the disturbance – greater or less than 1 ha, respectively.

In the instance where a polygon was split by a linear feature, and the plant community was determined by visual assessment to be the same on both sides, the first polygon received a transect and a range health assessment, and the second received a range health assessment only. This was done because the first transect was assumed to be representative of the plant community of both polygons, while the range health of each could have varied as a result of the disturbance.

Wetlands were assessed by first observing the bands of vegetation radiating outwards from the water's edge, and documenting the three most prominent species in each band, as well as the approximate percentage of the riparian area was made up by each band. The percentage of bare ground, extent of pugging and animal impact, and percentage of invasive species was also estimated for each band, and used to determine the overall health of the riparian area as follows:

- Healthy: < 1% invasive species, no bare ground, no pugging.
- Healthy with Problems: < 15% invasive species, < 15% bare ground, visible pugging.
- Unhealthy: > 15% invasive species and/or > 15% bare ground, visible pugging.

Because ACR wetlands are man-made, typical riparian health assessments were not deemed necessary. "Bare ground" was classified as visible soil found between vegetation that would still have been bare if the water was at its usual level, not just ground left bare by receding water.

Numbering

Polygons were numbered in a three-part system. The first number is the field number, 4. The second number corresponds to the original GVI polygon, numbered arbitrarily by myself, 1-9. While the original map only had 7 non-riparian, upland polygons, two additional ones were created by the author for ease of identification: the CWG patches were treated as their own polygon, polygon 1, and largest polygon (polygon 2) was split in two along the powerlines, creating polygons 2 and 8. The third and final number corresponds to the polygon's range health assessment, and usually increases chronologically, from 1 through to 44. Polygon 4.3.1 therefore corresponds to the first transect and range health assessment conducted in polygon 3 of field 4. Transects share the same numbering system, so that they may be quickly linked to their polygon.

Results and Discussion

This summer's focus was on native field 4, an 1178 acre field on the south-west corner of the property. It borders with one canal, two gravel roads (one running through field 3, and one adjacent to the canal), native fields 1 and 3, and one neighbouring farm to the south. Field 4 is underlain by soil of the Hemaruka soil series (HUK), with a corner in the northeast belonging to the Ronalaine series (ROL). Within the pasture, there are 11 man-made wetlands, all of which are linked by canals, 6 well sites, two two-track quad trails, a series of pipelines and dry ditches, 16 range cages (one group of 10, and one of 6), and one enclosure used to measure biomass productivity. The man-made wetlands were installed by Ducks Unlimited in the 1980s, and two were dry at the time of inventory collection. Salting locations vary, but are generally placed on the western side of the paddock, where the cattle are less inclined to graze on their own due to its distance from main gates and water sources.

The GVI map to be ground-truthed showed 7 upland polygons, and 11 Lentic riparian areas. Of the upland GVI polygons, the majority were classified in GVI as primarily loamy (Lo). However, after ground-truthing and breaking up these 7 GVI polygons into 66 smaller, plant community polygons, 75% of the area corresponded with blowout (BlO) range sites, and plant communities DMGA15, DMGA16, DMGA34, DMGA35, and DMGA39 were common (**Table 2** and **Figure 2**). Only 8% of sites were found to be loamy, and 12% were sub-irrigated (Sb) – a combination of 6% overflow (Ov) and 6% saline lowland (SL).

Most blowout sites have excellent ground cover of moss and lichen, and have uncommonly high amounts of *Poa pratensis* present, increasing their biomass productivity to above-average levels. The western-most sites also have small amounts of CWG present, and areas near dry ditches have some patches of weedy species, such as thistle (*Sonchus arvensis* and *Cirsium arvense*). The weedy species and CWG are explained by nearby development, but the amount of *Poa pratensis* was unexpected. It is likely due to a combination of factors: the increased precipitation the Brooks area has received over the last 10 years, causing *Poa pratensis* to replace *Poa sandbergii* in the DMGA39 plant communities, and the undergrazing of areas in field 4 west of the wetlands, allowing the *Poa pratensis* to go to seed. **Figure 3** is a detailed comparison of the precipitation levels in Brooks from the years 1996-2006, to the years 2007-2017, and illustrates this 10 year wet cycle. Antelope Creek Ranch is approximately 16km away from Brooks, and some variation is possible. Historically, cattle have favoured the eastern side of the paddock because it is close to the gate through which they enter the field, and management has observed that they spend much of their time there, only moving west when the eastern side has become over-grazed. As the wetlands are the herd's main water source, and these lie in the centre of the polygon (**Fig. 1**), cattle require incentive to move beyond them. Consequently, management has been placing salt blocks in the west side of the paddock. However, the areas in the centre and east of the paddock, between the wetlands and the main gate, are still the most heavily utilized, and are where nearly all of the healthy with problems (HWP) scores were observed (**Fig. 4**). The west side of field 4 also has the least amount of human interference – by well-sites, roads to well sites, pipelines, or man-made wetlands – and received consistently healthy ratings. Additionally, of the 75% of field 4 covered by blowout range sites, over 49% are late-stage blowouts DMGA15, 16, and 35, indicating that these blowouts are beginning to break down and becoming successional to loamy sites. The increased plant biomass caused by the 10 year wet cycle, along with the late seral stage of the majority of field 4's blowouts, could explain why they were mistaken as loamy sites when the aerial photo was analysed. This serves as an example of the importance of ground-truthing.

The overflow and saline lowland areas were accurately reflected by the initial GVI map. Most overflow sites received HWP or unhealthy ratings due to the presence of weedy species, or a large amount of bare ground and pugging in the heavily grazed sites in the east of the pasture. Nearly all of the saline lowland sites received unhealthy ratings (**Fig. 4**). This can also be largely attributed to the 10 year wet cycle which has likely kept these areas submerged for periods of time, possibly bringing sub-surface salts to the root zone of plants, affecting the plant community composition and increasing bare ground.

As **Table 2** and **Figure 2** illustrate, the range site type with the smallest land percentage is loamy. Of those sites, however, almost all received healthy ratings. As **Figure 4** illustrates, the only sites that were rated healthy with problems are those closest to the main gate and road within the paddock, as they are the most highly disturbed by development and traffic, and the areas most favoured by cattle, and therefore the most susceptible to overgrazing.

The most highly grazed areas in the east seem to have the lowest cover of CWG. This is likely because cattle are introduced to the paddock when CWG is vegetative and palatable, and the eastern areas nearest the main gate are the easiest to access. In the west, however, CWG stands may be wolfy and unpalatable by the time cattle find them, and are consequently left standing and able to set seed.

Wildlife use of the paddock is high. A wide variety of birds were frequently spotted in the wetlands, including pelicans and marbled godwits. Coyotes were spotted twice and heard frequently, and prong-horn antelope were spotted twice: on one occasion, I surprised a coyote stalking a prong-horn buck, and on another I saw a mother and her fawn. The fawn ran under the fence into paddock 3, and the mother attempted to lure me away from it. I later found the fawn curled up in the grass, waiting for its mother.

Of the 66 polygons, 28 were given healthy ratings, 25 healthy with problems, and 12 unhealthy; the majority of healthy ratings are located on the west side of field 4 (**Fig. 4**). Most disturbance-related agronomic species appeared to be restricted to the disturbance itself: there was very little evidence of spreading of pipeline reclamation species like *Bromus inermis* and *Festuca spp.*, though there appeared to be some wind-borne spread of CWG eastward from the west, and southward from the north. No polygons received a perfect health score, however, due to the extent of *Poa pratensis* across the pasture.

Concluding Remarks

The most pressing issues for management would be the spread of thistles and other weedy species from damp lowlands adjacent to disturbances, the wind-borne spread of CWG, and the disproportionate grazing of the eastern side of the paddock. Health scores were mainly lower due to agronomic species (*Poa pratensis*) resulting from the increased water table from the nearby industrial disturbance, the 10 year wet cycle and water development in the area. It is unlikely that grazing management was the factor in decreasing range health. Continuing salting on the west side of the pasture is likely the best management option, and skim grazing *Poa pratensis* in the spring may help with reducing its vigour in the pasture. It is more likely that range health will increase as agronomics and weedy species around lentic areas will decrease on their own, as the climate becomes drier. Identifying polygon boundaries was the most time-consuming aspect of the inventory process, especially where the changes were gradual. The hands-on training I received in identifying these boundaries on Antelope Creek Ranch, specifically, was especially helpful. The information presented here is meant as a visual representation of the 2017 season. The inventory process should be repeated every 5-10 years, to monitor the effects of precipitation trends and groundwater levels on plant community composition and rangeland health.

Tables and Figures

Table 1. Plant communities present in ACHDA Field 4, along with their respective areas, and the percent each makes up of the total pasture area of Field 4.

Plant Community	Area (ac)	Area (ha)	% Total Pasture Area
Cond 1 - Desc Cae, Hord Jub, Poa/Rume Cri (Ov)	41.5	16.8	3.4
Cond 2 - Festuca, Brom Ine, Stip Vir (BlO)	2.2	0.9	0.2
Cond 3 - Pucc Nut, Hord Jub, Poa/Sali Rub (SL)	61.1	24.7	5.0
Cond 4 - Stip Vir, Festuca (Lo)	8.8	3.6	0.7
DMGA15	315.9	127.9	26.0
DMGA16	262.0	106.0	21.5
DMGA2	44.1	17.8	3.6
DMGA3	34.6	14.0	2.8
DMGA34	14.9	6.0	1.2
DMGA35	76.5	31.0	6.3
DMGA39	235.9	95.5	19.4
DMGA44	8.2	3.3	0.7
DMGA51	18.4	7.4	1.5
DMGA60	2.66	1.0	0.2
DMGB1	19.7	8.0	1.6
DMGB2	6.5	2.6	0.5
DMGB7	1.0	0.4	0.1
DMGC3	3.7	1.5	0.3
Industrial Disturbance	2.7	1.1	0.2
Wetland/Lentic	56.8	23.0	4.7

Table 2. Percentage of ACHDA Field 4 comprised of different ecological site types.

Ecosite	% Area
BlO	75.8
Lo	8.1
SL	5.7
Ov	5.5
Lentic	4.7
Industrial	0.2

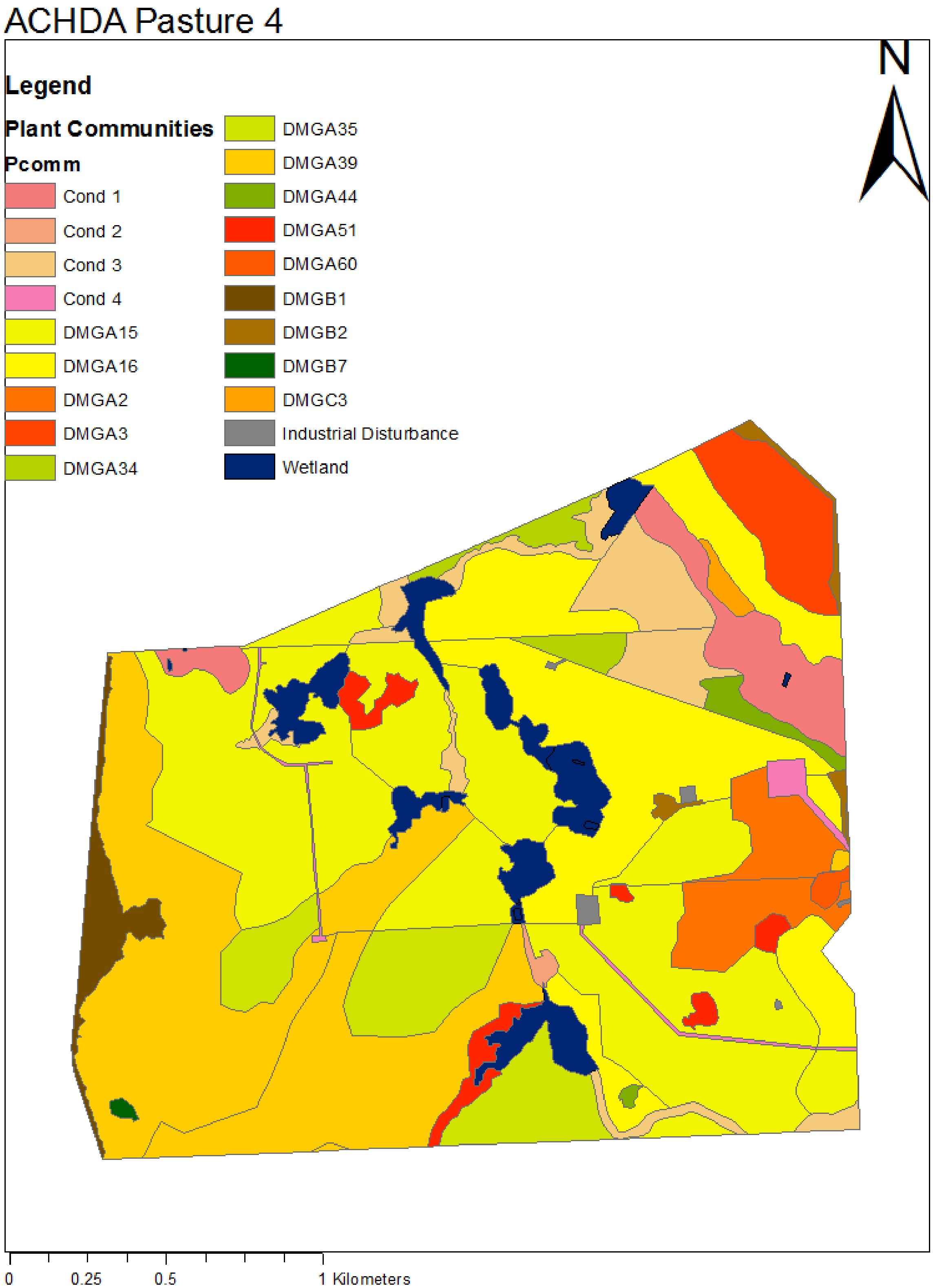

Figure 1. Plant community polygons of ACHDA Field 4.

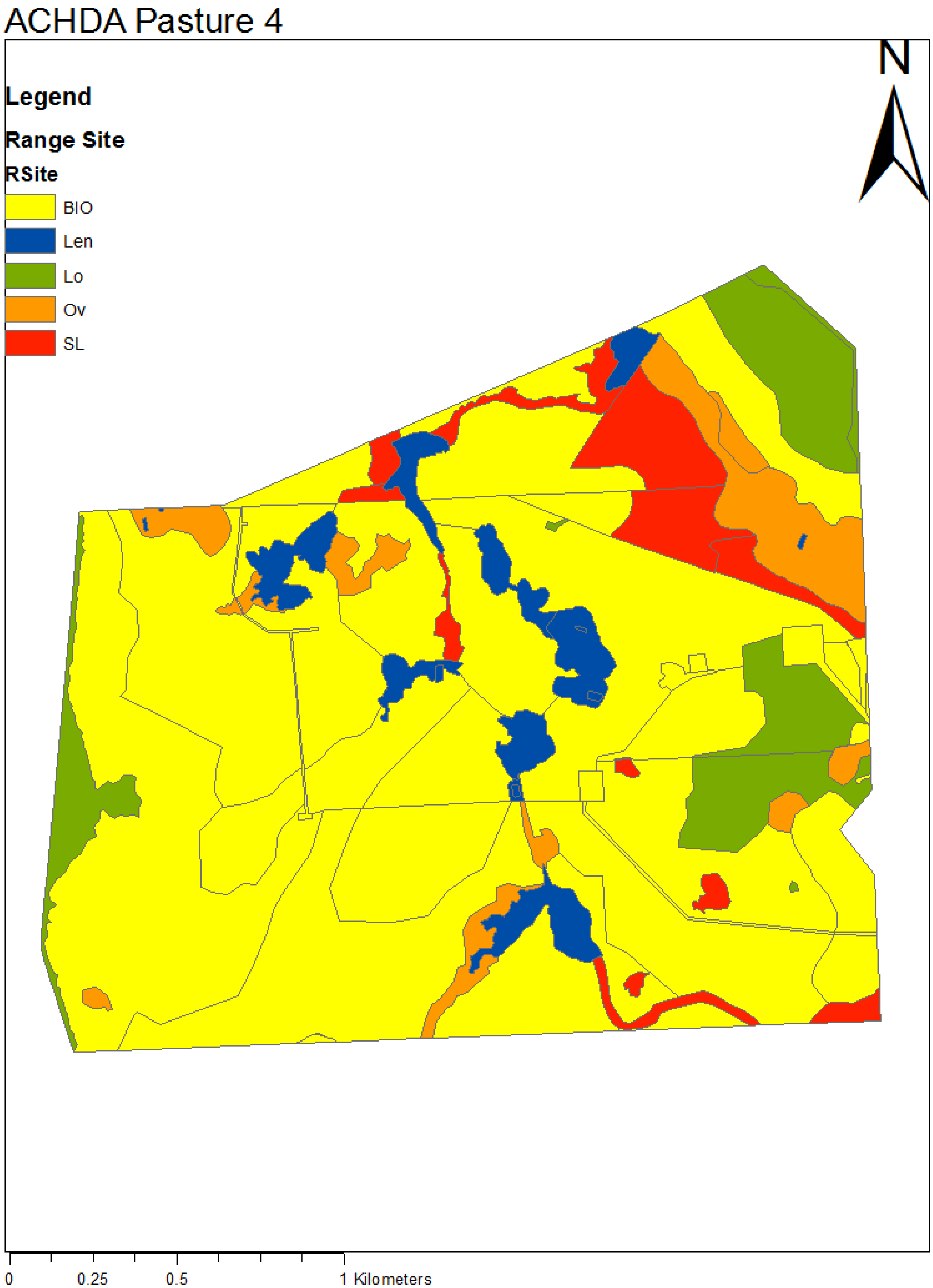

Figure 2. Ecological site types of ACHDA Field 4.

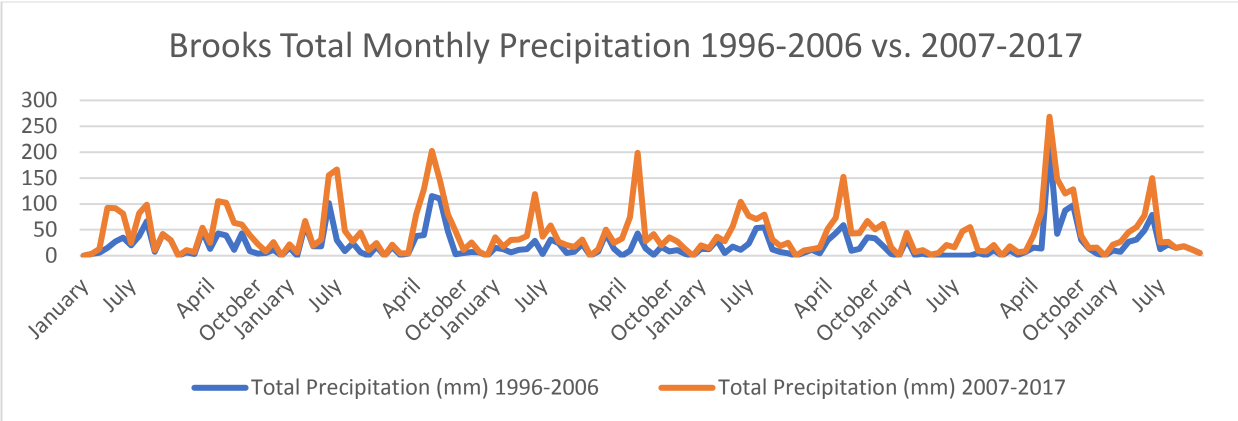

Figure 3. Comparison of the total monthly precipitation measured in Brooks, 1996-2006 vs. 2007-2017. Data retrieved from http://climate.weather.gc.ca/ in August 2017.

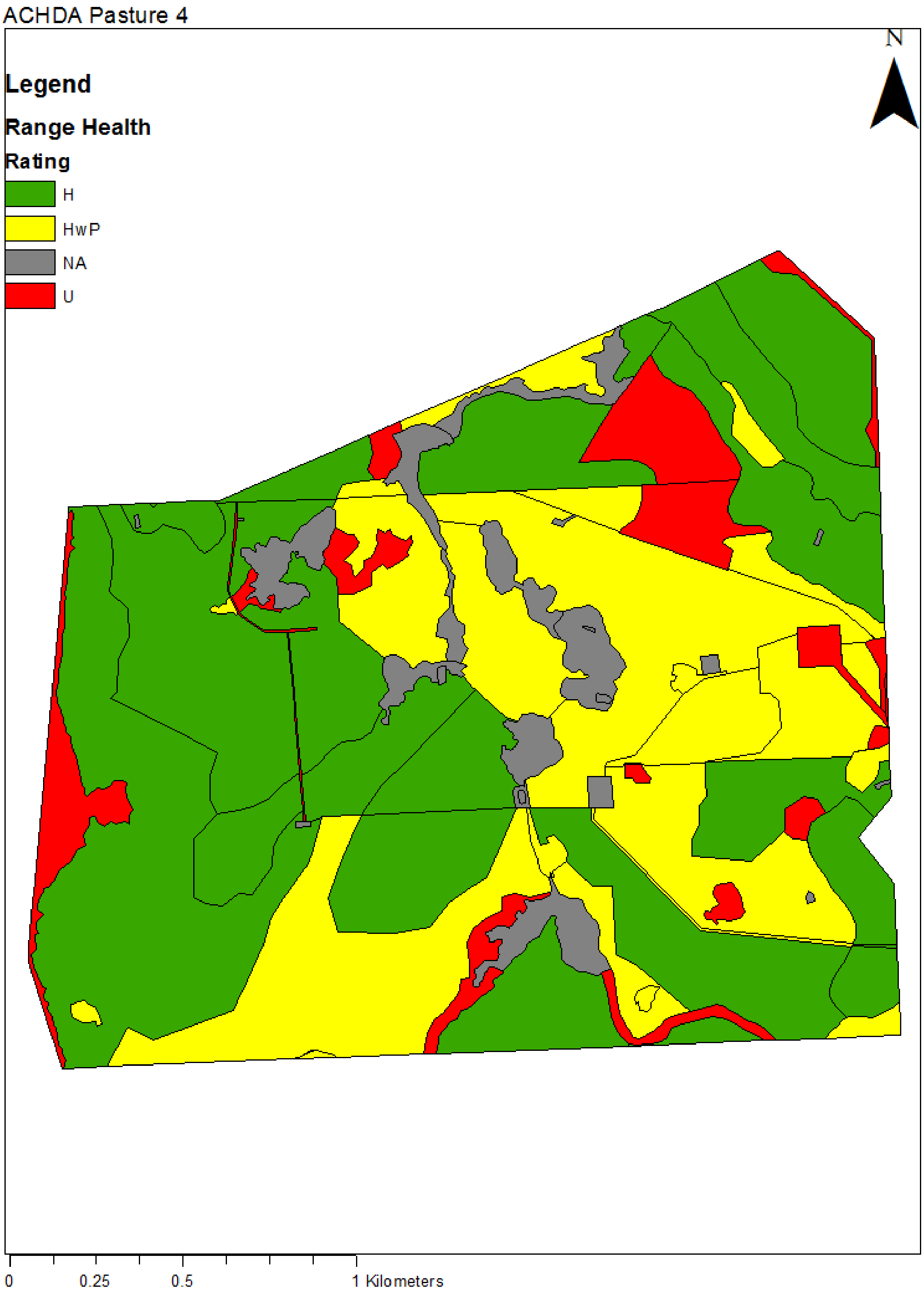

Figure 4. Range health ratings of Field 4 polygons.