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South East Alberta Watershed Alliance

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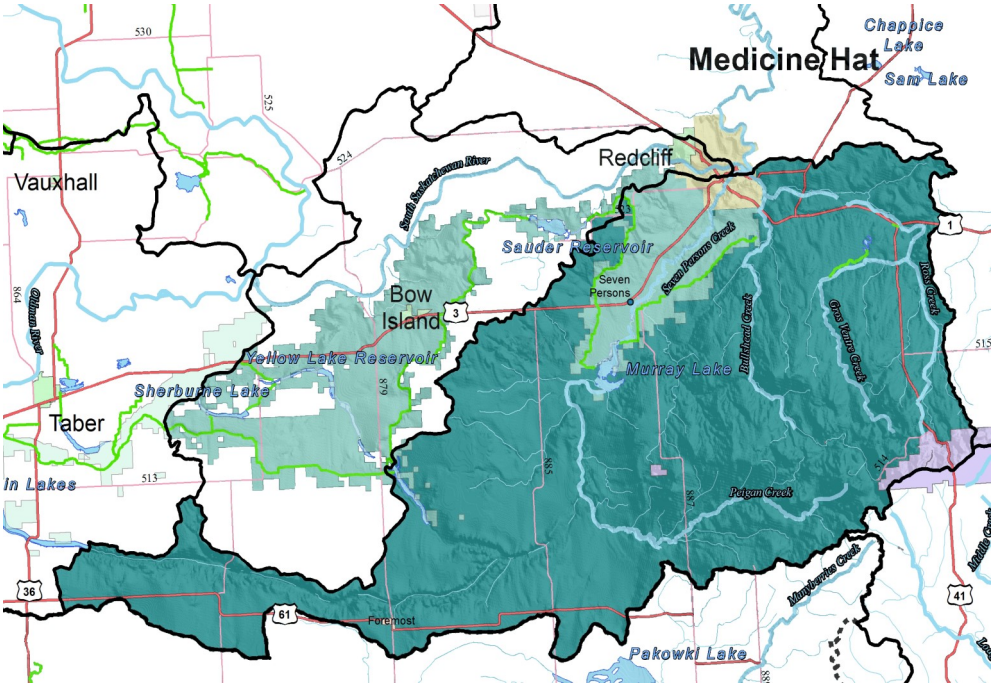
Aerial Assessment of Riparian Areas in the Seven Persons Creek Watershed

Summary October 2018

Objectives

- *Identify riparian areas for restoration and conservation.*
- *Establish baseline information in a digital format to be used for future planning and monitoring.*
- *Provide context for land use effects on riparian and aquatic ecosystems in the Seven Persons Creek Watershed.*

The Seven Persons Creek Watershed (SPCW) is located primarily south and west of Medicine Hat and includes parts of the City of Medicine Hat, Cypress County and the County of Forty Mile. The watershed also includes a small piece of the County of Warner and a small portion of the M.D. of Taber. Seven Persons Creek enters the South Saskatchewan River as it flows through Medicine Hat.



In 2016, the South East Alberta Watershed Alliance (SEAWA) received grants under Alberta's Watershed Resiliency and Restoration Program to restore and protect riparian areas within the SEAWA watershed.

In 2017, Stantec Consulting Ltd. assessed and classified the condition of riparian areas within the SPCW. Stantec used object-based image analysis (OBIA) and Riparian Health Assessment (RHA) field surveys based on Alberta Cows and Fish methods to calibrate and develop riparian health scores of sites. They also reviewed publicly available data and imagery to rank riparian condition, identify human disturbances (irrigation canals, dams, water control devices, etc.), natural disturbances (vegetation presence and homogeneity, slope and asymmetry), delineate riparian areas (floodplains) and assess overall riparian condition.

Assessment and Evaluation Methods

First steps included the identification and delineation (segmentation) of riparian areas using OBIA. Locations with land access were then selected for RHA field survey to calibrate and develop an RHM to predict health scores based on imagery. Individual riparian areas were assessed for health using either the Riparian Heath Assessment Lotic Survey (11 questions) or Lentic Survey (nine questions). At each site, the field crew walked the entire riparian area assessing vegetation conditions, looking for signs of human disturbance and scoring the total area for overall health. Eighty-eight riparian areas (63 lotic and 25 lentic) were assessed in the field.

Lotic *ecosystems refer to those associated with flowing water such as springs, creeks, streams and rivers.* ***Lentic*** *ecosystems are associated with relatively still waters such as lakes, ponds, marshes and bogs.*

Stantec identified and classified a total of 15,473 riparian areas within the SPCW with 81% defined as lotic (12,568) and 19% defined as lentic (2,905).

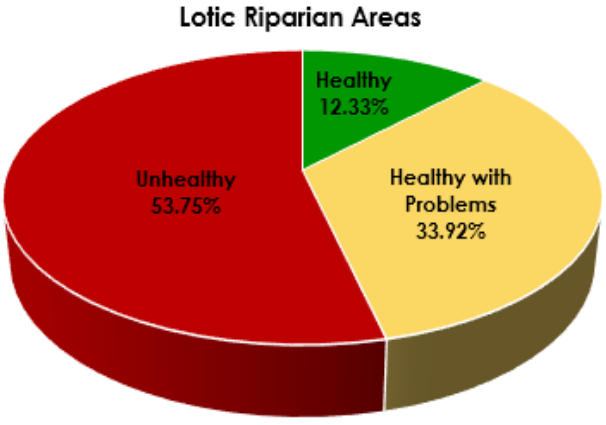
OBIA statistics (spectral reflectance, texture, shape and size) were compared to field survey scores. The OBIA software was then "trained" to assign riparian health scores and the Riparian Health Model (RHM) was developed and used to predict the health score of all remaining riparian areas within SPCW. By using this modified approach, which included a) high resolution imagery (2015; 25 to 50 cm resolution) and b) detailed elevation data (DEM 2010; 5 m resolution) many riparian areas could be assessed for riparian health in a timely, cost effective, and consistent manner.

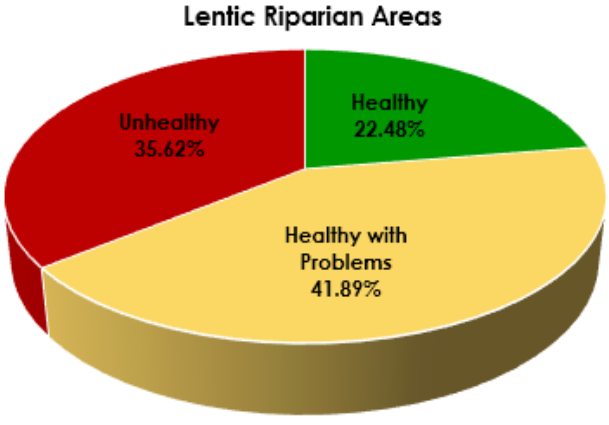
In the adjacent photo, the riparian area on the immediate left was designated as **Unhealthy** with little woody vegetation, exposed bare soil, and a high degree of incisement from erosion. The riparian area to the upper right was classified as **Healthy** with a moderate amount of woody vegetation, low slope, and good asymmetry.

The Alberta Cows and Fish health classification defines riparian areas with RHA scores of 100-80% as Healthy, 80-60% as Healthy with Problems, and 60-0% as Unhealthy.

The semi-arid landscape of the SPCW does not have many naturally occurring trees and shrubs and Stantec reduced the minimum requirement for the Healthy and Healthy with Problems categories by 5% each. This was the only deviation from the Cows and Fish protocol.

In the assessment of this watershed, many areas that are naturally deficient of vegetation and riparian sites with exposed soil and little plant cover were given a low riparian health score. An Unhealthy rating may therefore indicate a naturally sensitive area, not necessarily human-impacted degradation.

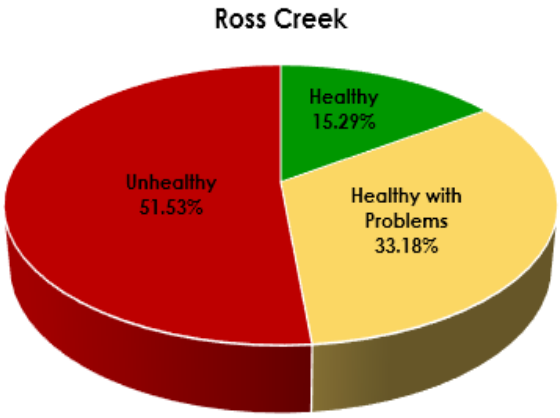




Assessment

Healthy lotic riparian areas in the SPCW typically paralleled the natural meandering of rivers and streams and were long, linear, and fairly flat. Areas of relatively low slope allow flood waters to rise and fall through the floodplain vegetation on an annual basis, replenishing moisture and allowing the vegetation to perform ecosystem services. Lotic riparian areas with vegetative cover in the form of trees or shrubs had a higher probability of good health.

Healthy with Problems lotic riparian areas in the SPCW shared many of the same properties as the Healthy areas but to a lesser degree. There was less woody vegetation, the shape of the riparian areas was less linear, and there was often more variation in elevation. There was visual evidence of anthropogenic activity within many Healthy with Problems riparian zones, either in the form of trails, equipment or trampling of vegetation.

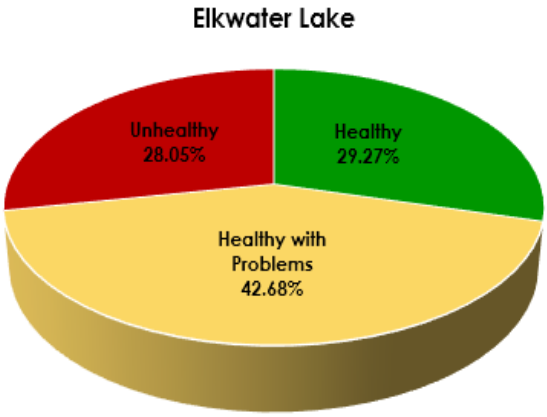


RHM Classification for each Health Class in Ross Creek, a lotic area within the SPCW.

Unhealthy lotic riparian areas typically either lacked significant woody vegetation, had poor shape correlation to rivers and streams, or had significant variation in elevation—possibly related to incised streambanks or human alteration. Unhealthy areas frequently had trampled grass, bare soil, or human-influenced ground surfaces. There were also a number of riparian areas that were in annual cropland, forage, or rangeland fields which were given an Unhealthy designation.

Healthy lentic riparian sites in the SPCW were strongly correlated with an indication of slope. Lentic areas with slope had well-established naturally occurring vegetation.

Unhealthy lentic riparian sites were correlated with little to no slope. Lentic areas of low slope were either subject to agricultural activity or had poor vegetative cover.

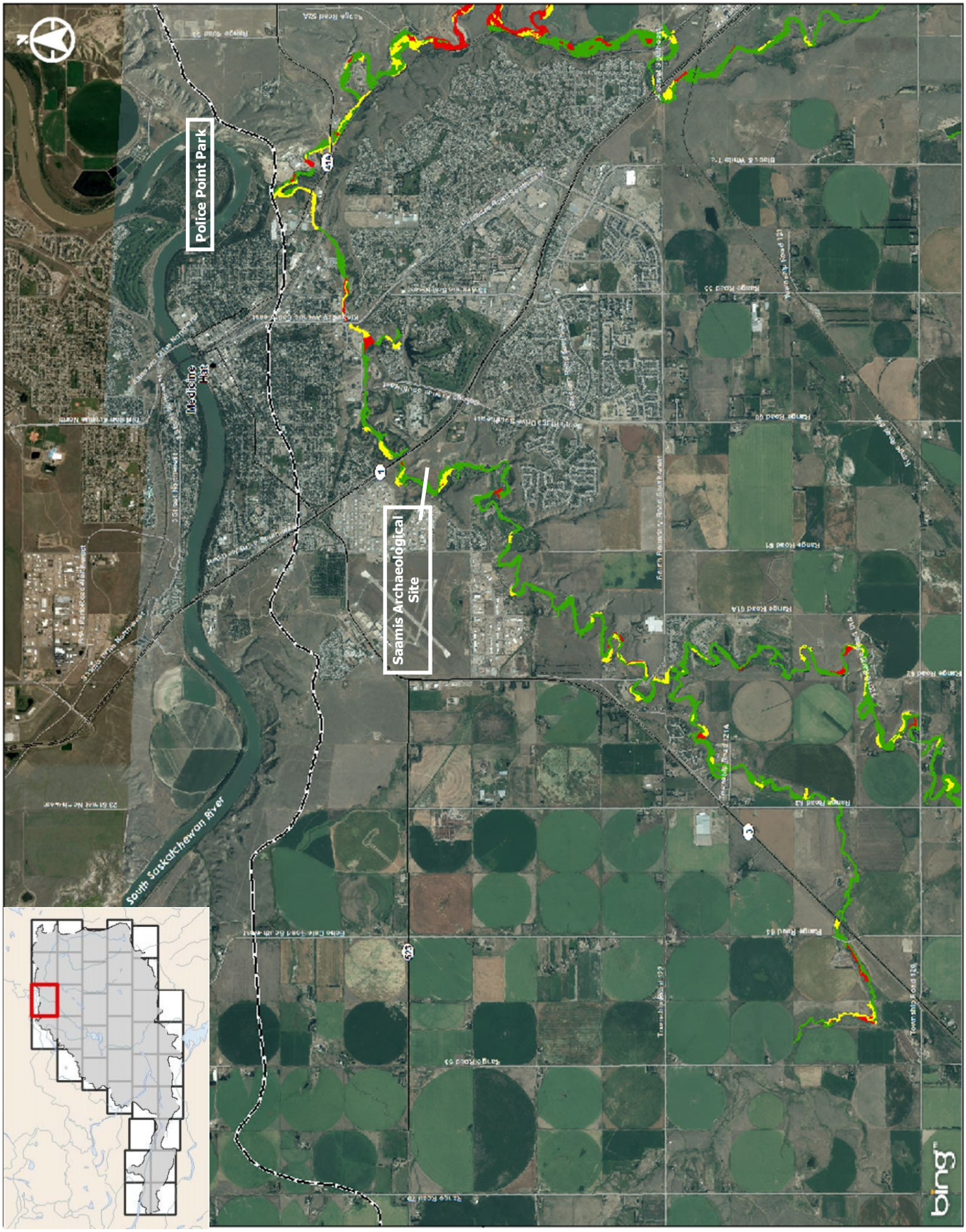


RHM Classification for each Health Class in Elkwater Lake, a lentic area within the SPCW.

RMH Classification summaries were also made for Seven Persons, Bullshead, Peigan and Gros Ventre Creeks, and Murray and Cavan Lakes. They can be found within the full report.

Conclusion

While some of the low ratings within the SPCW can be attributed to the natural landscape, many others could not, and the overall health of riparian areas in the SPCW was low. This is most likely due to agricultural pressure on the landscape from annual cropland, irrigation and related infrastructure, forage, and rangeland fields. Much of the watershed's natural vegetation has been altered or removed, and many wetlands have been partially or completely drained. A number of water bodies only exist due to damming for irrigation, resulting in riparian areas of river and stream systems being either flooded or deprived of water. Where the landscape was unaltered by human activities, the riparian areas were in good health, providing natural benefits to water quality and wildlife habitat.



The map above *(Map 7.2 - Lotic & Lentic Riparian Health Assessment in the Seven Persons Creek Watershed)* is an example of the individual "tile" maps within the full report. Each map represents one of 36 tiles within the SPCW (indicated in the inset). This tile captures most of the riparian areas of the SPCW within the city of Medicine Hat. The maps provide the assessed health rating for each riparian area within the specified zone. Green indicates **Healthy**, yellow: **Healthy with Problems**, and Red: **Unhealthy**.

Alberta Environment and Parks

Please visit seawa.ca to view the entire report

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