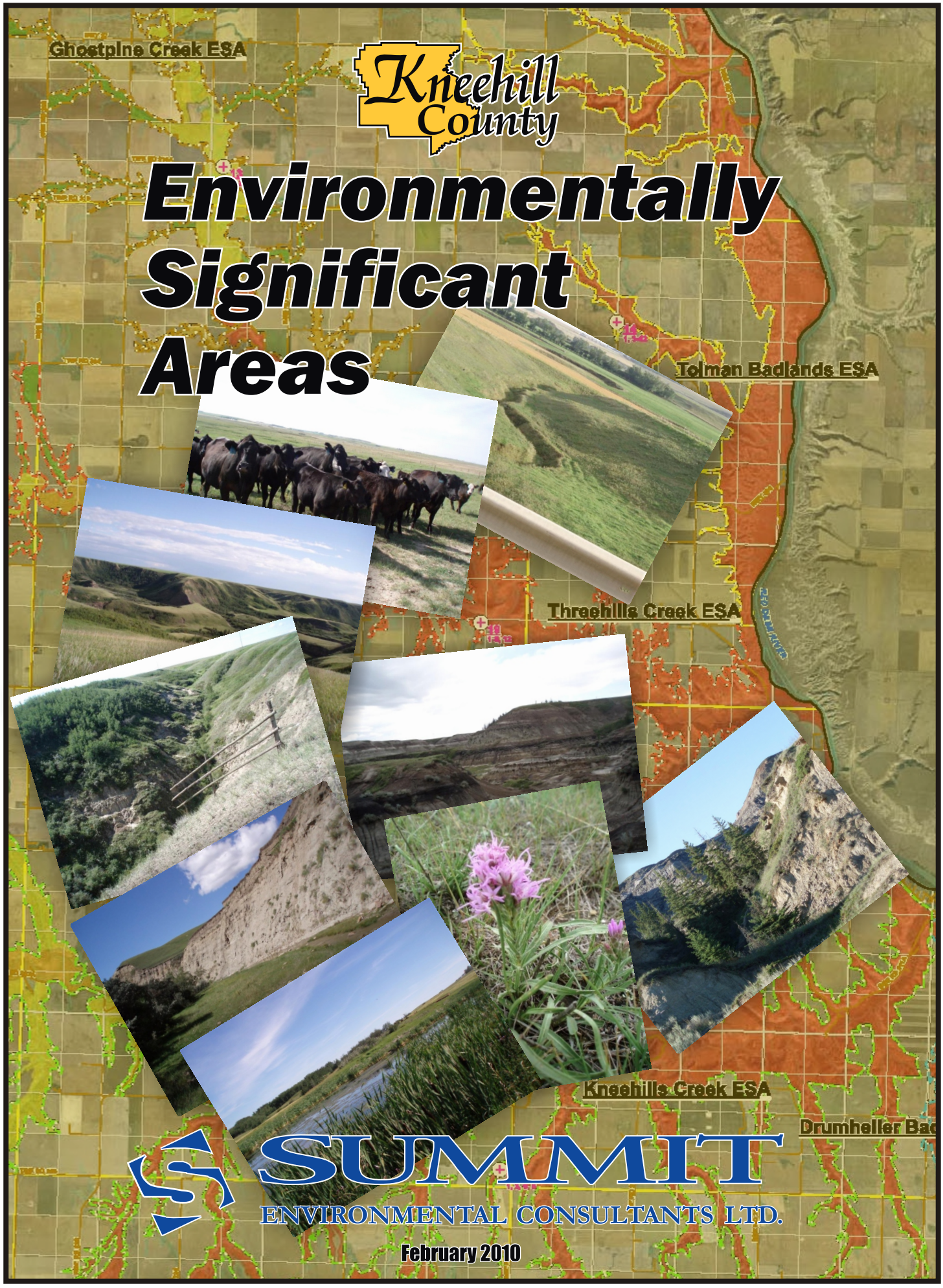
Kneehill County

Environmentally Significant Areas



SUMMIT
ENVIRONMENTAL CONSULTANTS LTD.

February 2010

SUMMIT
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March 23, 2010

Reference: 7513-001.01

Mr. Jerry Brett
Sr. Planning and Development Officer
Kneehill County
232 Main Street
Box 400
Three Hills, Alberta T0M 2A0

Dear Mr. Brett:

Re: Kneehill County Environmentally Significant Areas FINAL Report

Summit Environmental Consultants, Ltd. is pleased to provide the enclosed FINAL report, appendices, and maps detailing the results of the 2009 Kneehill County Environmentally Significant Areas review.

Should you require futher information or if you have any questions, please do not hesitate to contact Erin Rooney at (403)262-4500.

Yours truly,

Summit Environmental Consultants Ltd.

Erin Rooney, B.Sc., P.Biol.
Biologist

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LIST OF ACRONYMS

AAFC	Agriculture and Agri-Food Canada
ANHIC	Alberta Natural Heritage Information Centre
ASRD	Alberta Sustainable Resource Development
COSEWIC	The Committee on the Status of Endangered Wildlife in Canada
DFO	Department of Fisheries and Oceans Canada
DU	Ducks Unlimited Canada
ESA	Environmentally Significant Area
FWMIS	Fish and Wildlife Management Information System
HADD	Harmful Alteration, Disruption or Destruction
HRIA	Historical Resource Impact Assessment
HRV	Historical Resource Value
IBA	Important Bird Areas
LSD	Legal Subdivision
MDP	Municipal Development Plan
PFRA	Prairie Farm Rehabilitation Administration
SARA	Species At Risk Act
UNESCO	United Nations Educational, Scientific and Cultural Organization
UTM	Universal Transverse Mercator

1.0 INTRODUCTION

1.1 PROJECT BACKGROUND

The Alberta Municipality of Kneehill County retained Summit Environmental Consultants Ltd. (Summit) to provide an updated report and mapping of Environmentally Significant Areas (ESAs) within the County. Environmentally significant areas are defined as areas that are vital to the long term maintenance of biological diversity, physical landscape features and/or other natural processes at multiple spatial scales (Jennings and Reganold 1991 as cited in Fiera Biological Consulting 2009).

A 2007 Planning Department report advised Kneehill County Council the potential impacts of increasing development on the County's ESAs. Recent changes in the Land Use Bylaw prompted a re-evaluation of the original ESA Report (Cottonwood Consultants 1991). The bylaw changes allowed third-parcel subdivisions within agricultural quarter sections, as well as recognized the increased demands for clustered country residential development. Kneehill County Council identified funds for an updated ESA study that would improve the delineation of ESAs using improved data and new technologies.

The initial report completed by Cottonwood Consulting Ltd. in 1991 identified, mapped and ranked ESAs within Kneehill County. That report also included mapping of hazard lands, culturally significant areas (including historical and archeological sites), and areas of paleontological sensitivity. This report updates all of the original information, provides management guidelines, and identifies data gaps.

Kneehill County covers an area of approximately 814,653 acres and includes the towns of Three Hills and Trochu, the villages of Linden, Carbon, and Acme, and six hamlets. The main industry is agriculture, although there is also a strong oil and gas presence (Kneehill County 2009). Conserving significant areas within the County is essential to protect the overall biodiversity, natural ecosystem functions (e.g. hydrological function), rare and

unique geological or physiographic features, wildlife movement corridors, and public values.

We understand that this ESA document will be used by Kneehill County to aid in the planning process by identifying and managing sensitive and significant areas within the County. Given the resolution of the air photos provided, the ESAs can be used up to a scale of 1:10,000.

1.2 PROJECT OBJECTIVES

The overall objective of this study was to utilize the existing ESA report completed by Cottonwood Consultants Ltd. (1991) to create a new ESA document and mapping tool. The updated report will help guide land-use planning, which in turn will help ensure the maintenance, protection and enhancement of Kneehill County's natural resources. The refined ESA definitions, the mapping, and the report consider:

- the extent of previously classified ESAs in Kneehill County;
- the types of features within these ESAs, their ecological and public values, and sensitivity to disturbance; and,
- the most current provincial views and legislation important to ESAs.

The specific objectives of this project included the following:

1. Digitize boundaries of the ESAs identified in 1991;
2. Review the features that characterize each ESA area, based on:
    - the lists of features for each ESA identified by Cottonwood Consultants (1991),
    - background information and professional input,
    - air photo interpretation,
    - a list of public comments,
    - historical resource records,
    - site observations, and

- the list of ESA criteria;

3. Evaluate the relative significance of ESAs and assign values (ESA-1 through 4) based the information from Objective 2;
4. Provide digital mapping (Geographical Information Systems) that is compatible with the County's mapping software (i.e., projected in UTM Zone 12 and NAD83 format), showing previously delineated ESAs, updated with the revisions to the ESA boundaries, levels of significance, and list of ESA criteria that characterize each;
5. Offer guidelines for future management of the ESAs; and
6. Provide draft and final reports that will summarize methods, results and recommendations for managing ESAs in Kneehill County and that will be presented to the Kneehill Council for input.

To supplement the ESA information, this report also reviews the historical and paleontological sites that were included in the 1991 report (Appendix D; Temoin 2008). Additionally, a summary and map layer containing information on the updated provincial review of ESAs in Alberta is provided to allow for comparison of ESA mapping at a county and provincial level scale (Fiera Biological Consulting 2009).

The purpose of this report is to support planning and land use decisions consistent with Kneehill County's Municipal Development Plan (Kneehill County 2005), and to help meet legislative requirements for developments near or in an ESA. The data are spatially explicit, and can be provided to land managers for their use. Summit has also recommended management plans and mitigation actions that can be used as reference material for impact assessments, area structure plans and public stewardship.

1.3 PROJECT APPROACH

The process of creating the updated ESAs involved a number of iterative processes including public consultation, mapping, field truthing, and reporting. Figure 1.1 outlines the actions that were required to produce each deliverable in the updated ESA review.

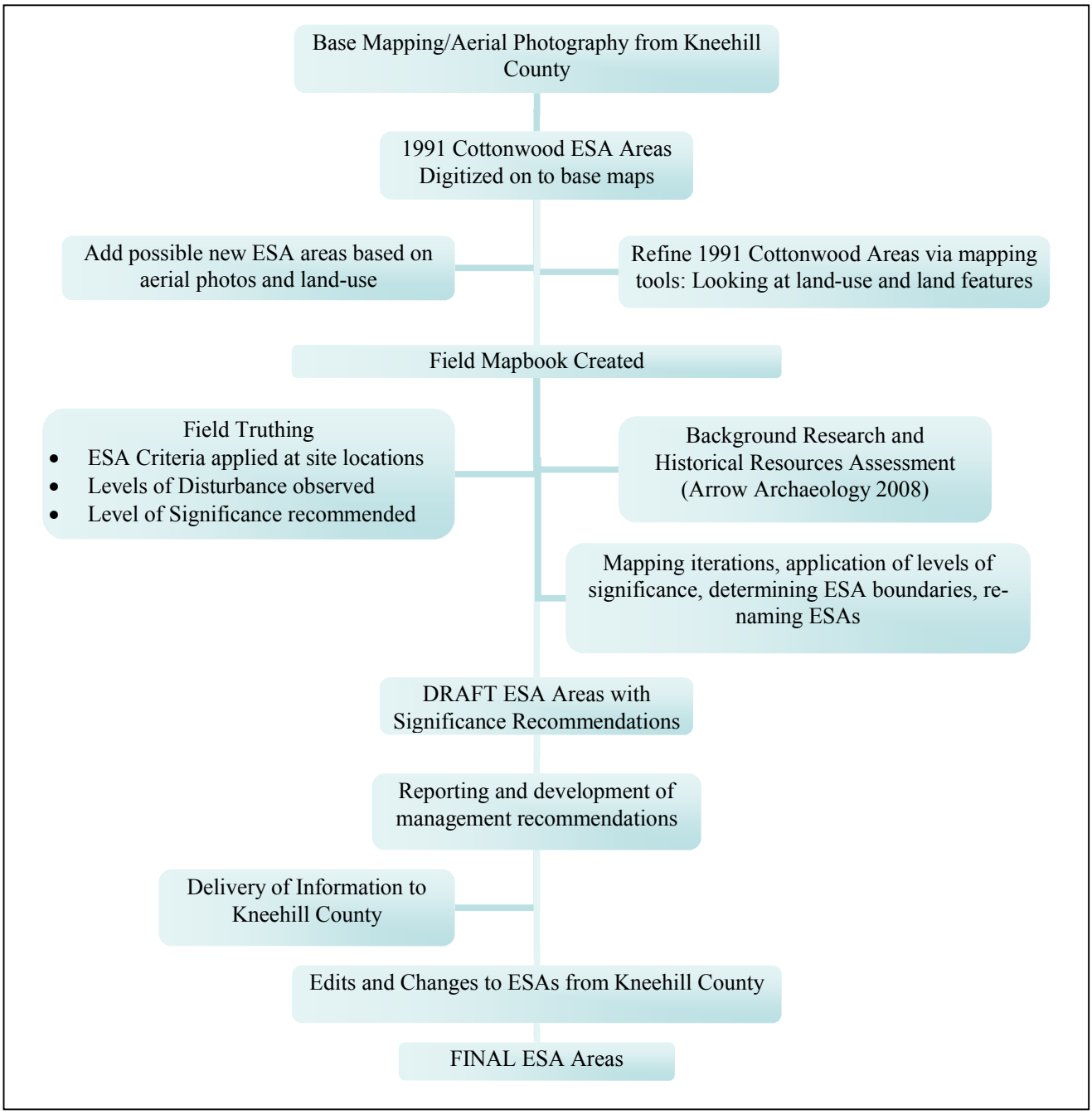


Figure 1.1 Project outline of 2009 ESA review for Kneehill County

2.0 ENVIRONMENTALLY SIGNIFICANT AREAS (ESAs)

2.1 DEFINITIONS OF ESAS

Original ESA Definitions

Cottonwood Consultants (1991) identified ESAs as important, useful and often sensitive features of the landscape which, as an integral part of sustainable development strategies, provide long- term benefits to our society by maintaining ecological processes and by providing useful products. A set of eleven criteria were used to identify ESA areas (see Section 2.2).

That original report included ESAs of regional, provincial, national and international significance, based on the types of features they contained. Regional features are those that are of limited distribution or are the best examples of a feature in the Kneehill County; provincial features are those that are limited in distribution at a provincial level or that are the best examples of features in Alberta; and national features are those that are limited in distribution at a national level or that are the best or only representatives in Canada (Cottonwood Consultants 1991).

The following areas were considered to be of regional significance:

1. Key areas for deer;
2. Production and staging areas for waterfowl or shorebirds;
3. Nesting and feeding areas for birds of prey;
4. Diverse areas of natural habitat; and,
5. Remnant areas of fescue grassland and aspen parkland.

Areas of local significance were shown on 1:50,000 National Topographic Series working maps as "uncultivated lands that lie outside the boundaries of the regionally, provincially and nationally significant ESAs." However, these areas were not deemed significant enough to be included in the regional ESAs and were therefore not included in their summary maps of individual ESAs.

In addition to mapping the ESAs, Cottonwood Consultants (1991) mapped hazard areas (i.e. areas with major physical constraints that limit development potential), including steep/unstable slopes, permanent wetlands, floodplain, artesian flow and sand dunes.

Updated ESA Definition

In a recently updated document of provincial ESAs in Alberta, ESAs are defined as areas that are vital to the long term maintenance of biological diversity, physical landscape features and/or other natural processes at multiple spatial scales (Jennings and Reganold 1991 as cited in Fiera Biological Consulting 2009). This definition does not affect the consistency in ESA classification between the 1991 and 2009 studies because, in both studies, the identification of an ESA was primarily based on the same set of eleven ESA criteria (with one additional criterion added, see Section 2.2).

Summit did not distinguish which areas were regionally, provincially, nationally and internationally significant. Rather, the levels of ESA significance were based on a ranking scheme from ESA-1 to -4 (see Section 2.3).

2.2 CRITERIA USED TO IDENTIFY ESAS

Cottonwood Consultants (1991) originally used a set of 11 criteria to identify and classify ESAs that were developed and used consistently throughout the province when counties and municipalities were creating ESA documents in the 1990s. In order to maintain the consistency of identifying ESAs in 2009 Summit adopted these, and included one more (#12 – Historical importance).

The criteria were used to systematically compare sites, determine ESA boundaries, and contributed to ranking the level of significance (Section 2.3). Each of the 12 criterion were assumed to be equally important and to contribute equally to the overall ESA significance ranking. The ESA criteria help decision makers by specifying what types of

features and functions make an area environmentally significant, and what types of management practices are appropriate.

The twelve criteria are as follows:

1. Hazard lands and areas that are unsafe for development in their natural state such as floodplains and steep and unstable slopes; or that pose severe constraints on types of development such as Aeolian surficial deposits and permanent wetlands;
2. Areas that perform a vital environmental, ecological or hydrological function such as an aquifer recharge;
3. Areas that contain rare or unique geological or physiographic features;
4. Areas that contain significant, rare or endangered plant or animal species;
5. Areas that are unique habitats with limited representation in the region or are a small remnant of once large habitats that have virtually disappeared;
6. Areas that contain an unusual diversity of plants and/or animal communities due to a variety of geomorphological features and microclimatic effects;
7. Areas that contain large and relatively undisturbed habitats and provide sheltered habitat for species that are intolerant of human disturbance; and,
8. Areas that provide an important linking function and permit the movement of wildlife over considerable distances, including migration corridors and migratory staging areas;
9. Areas that are excellent representatives of one or more ecosystems or landscapes that characterize a natural region;
10. Areas with intrinsic appeal due to widespread community interest or the presence of highly valued features or species such as game species or sport fish;
11. Areas with lengthy scientific research; and,
12. Areas with historical importance.

2.3 RANKING OF ESAS

The ESAs, including those identified by Cottonwood Consultants (1991) and refined through Summit's methodology, were ranked from ESA-1 to ESA-4 with ESA-1 being the highest level of significance. Because the ESAs were ranked relative to one another within the County, these rankings do not necessarily indicate how significant an ESA is relative to areas outside the boundaries of Kneehill County.

The four levels of significance (i.e. ESA rankings) were based on the number of ESA criteria that applied to the area, general vegetation health, levels of disturbance, sensitivity to disturbance, and the extent or prevalence of similar ESAs (i.e. similar ranking and criteria) throughout the County (Table 2.1). Disturbances include roads, oil and gas development, pipelines, grazing pressures and a variety of land-uses.

The intention of including lower ranked ESAs (ESA-3 and 4) is to indicate areas that are partly degraded but meet one or more of the ESA criteria, and have potential to become healthier functioning ecosystems (ESA-1 or 2). All of the ESAs should be considered for preservation and/or restoration. ESAs one through four were generally considered to have the following characteristics:

ESA-1 (Very High Significance)

- High habitat quality for rare and common wildlife and native plant species;
- Unique ecological area, uncommon in the local area;
- Low level of disturbance as indicated by heavy weed or invasive plant species presence; agricultural land development (land use alteration); industrial development (including oil and gas development) or other land fragmentation (e.g. recreational development);
- Sensitive to disturbance; and,
- Typically meet more than three ESA criteria (as listed in section 2.2).

ESA-2 (High Significance)

- Limited high and predominantly moderate habitat quality for rare and common wildlife and native plant species;
- Limited distribution in the local area, but not uncommon;
- Low to moderate level of disturbance; and,
- Typically meet three or fewer criteria.

ESA-3 (Moderate Significance)

- Limited moderate and predominantly low habitat quality for common wildlife and native plant species;
- Moderate to high level of disturbance; and,
- Typically meet two criteria.

ESA-4 (Low Significance)

- Low habitat quality for common wildlife and native plant species;
- Are highly disturbed; and,
- Typically only meets one criterion.

Table 2.1 Ranking of criteria used to determine level of significance for Kneehill County Environmentally Significant Areas.

Level of Significance			
1	**2**	**3**	**4**
High Habitat quality for rare and common wildlife and native plant species	Limited high and predominantly moderate habitat quality for rare and common wildlife and native plant species	Limited moderate and predominantly low habitat quality for common wildlife and native plant species	All defined ESAs that did not fall into the other Significance Ratings
Unique ecological area, uncommon in the local area	Limited distribution in the local area, but not uncommon	Moderate to high level of disturbance	
Low level of disturbance	Low to moderate level of disturbance	Typically two criteria apply	
High sensitivity to disturbance	Typically three or fewer criteria apply		
Typically three or more criteria apply			

3.0 METHODS

3.1 INFORMATION REVIEW

Summit gathered information from various sources to gain a more thorough understanding of the County's physical setting and natural features (e.g. grasslands, wetlands, aspen forest, coulees, etc.). The information review also helped to characterize and delineate ESAs and develop management recommendations. The following sources were consulted.

Non-government agencies and associated persons

- Alberta Natural Heritage Information Centre (ANHIC) – Element Occurrence Data (Alberta Tourism, Parks and Recreation 2008)
- Red Deer River State of the Watershed Report (Aquality Environmental Consulting 2009)

- Alberta Riparian Habitat Management Society (Cows and Fish 2009)
- Waterfowl density map - a decision support system map developed using CWS/WSFWS population survey data, habitat characteristics derived from Ducks Unlimited Wetland Habitat Inventory, the Canada Land Inventory of Waterfowl Capability and geographic location (McFarlane pers. comm. 2009)

Municipal, regional, provincial and federal Agencies and Legislation

- Kneehill County Land Use Bylaw 1564 (Kneehill County 2008)
- Kneehill County Municipal Development Plan Bylaw 1507 (Kneehill County 2005)
- Operational Statements (Fisheries and Oceans Canada 2009)
- Weed Survey On-line Map (Alberta Agriculture and Rural Development 2009)
- Kneehill County 2008 ownership map, public engagement comments (Brett pers. comm. 2008)
- Alberta's New Wetland Policy (Alberta Water Council 2008) and Implementation Plan (Alberta Water Council 2009)
- Code of Practice map – Brooks Management Area (Alberta Sustainable Resource Development (ASRD) 2006)
- Water Act – (Government of Alberta 2000a)
- Natural Regions and Subregions of Alberta (Natural Regions Committee 2006)

Alberta Sustainable Resource Development

- Alberta Land Stewardship Act – Bill 36 (Government of Alberta 2009a)
- Land-Use Framework (Government of Alberta 2009b)
- Fish and Wildlife Management Information System (ASRD 2008b)
- Fish and Wildlife Division (ASRD 2001, 2005, 2008a)

Private Consultants

- ESA report (Cottonwood Consultants 1991)

- Historical Resources Data Review and Analysis, Kneehill County, Alberta (Arrow Archaeology Ltd. (Temoin 2008)
- Regional groundwater assessment of potable groundwater in Kneehill County, Alberta (Stantec Consulting Ltd. 2005)

3.2 PUBLIC CONSULTATION

Citizen engagement was of prime importance for this review because it allowed the production of a more detailed, open and transparent study. Kneehill County staff created a database of affected landowners and leaseholders who were then contacted through a bulk mail-out process. The information package explained the rationale behind the new study and also provided a Landowner Authorization and Response Form. The recipients were then able to provide authorization for access (or refusal) to their lands as well as communicate any concerns or issues they believed to be important to them on the return form. They then had a choice of faxing, mailing or dropping off their signed response forms. Landowners were also encouraged to contact County staff with any issues they may have of the process or the need for the study.

Data received from respondents was tabulated and passed on to Summit (Brett pers. comm. 2008). The information and authorization to access landowners' properties helped Summit to select sites for ground truthing and assisted in determining the criteria and level of significance to assign to each ESA.

3.3 MAPPING

ESA areas within Kneehill County were created through on-screen digitizing on a PC workstation using ESRI's ArcView 9.2 and ArcInfo 9.2 geographical information system (GIS) software (ESRI 2006). ESAs were digitized using a combination of 1 m black and white (2005) and 30 cm color (2007) orthophotography of the County. A minimum digitizing scale of 1:3,500 was chosen for the delineation of the ESAs. Although the

imagery can support a larger scale, this limitation was set to allow for efficient yet detailed digitizing of potential ESAs.

The original ESA data from Cottonwood Consultants (1991) were not available digitally so Summit recreated this information in an updated, refined, and more complete version of the previously named ESAs based on the orthophotos provided by Kneehill County. This process outlined what appeared to be generally contiguous areas in a natural state – i.e. not farmed, grazed, or developed. The types of areas that were identified as potential ESAs included, but were not limited to, forested, riparian, open water, wetland, and badland feature types.

The creation of the ESA layer in the GIS used the existing legal subdivision (LSD) polygon layer supplied by Kneehill County. First, the road easements in the County had to be "filled in" because they were not included as part of the LSD polygons. ESA_Name and ESA_Class attributes were also added to the layer at this time. Once a single layer covering the entirety of the County and attributed with LSD values was created, it was cut using the "cut polygons" function to cut out the ESAs from the pre-existing LSD sections. This method automatically attributed LSD values to each ESA polygon. The ESA_Name attribute was updated at that time with its appropriate name based on its relation to the original name (Cottonwood Consultants 1991).

Once the ESAs initially identified by Cottonwood Consultants (1991) were reconstructed, additional areas were added based on photo interpretation. Subsequent to those additions, each LSD in the County was visually inspected to ensure that any and all potential ESAs were identified and accounted for in the GIS layer.

With ESA polygons identified for the entire county, a map book was created to facilitate field verification of the ESA polygons (Section 3.4). Once the field verification process was complete, edits were made to the ESA polygon layer based on modifications made in the field. These edits added, deleted, or refined the ESA boundaries and helped to

determine ESA rankings. This process resulted in a final ESA layer that has each ESA polygon attributed to an LSD location as well as an ESA name and class.

ESAs that were less than 1 km^2 and not clearly linked to a larger ESA were omitted from the final map. However small wetlands and forested areas, while too dispersed and widespread to accurately delineate, were also incorporated into the ESA criteria in general terms.

3.4 FIELD SURVEY

The field surveys were completed between August 17 and 25, 2009 by Erin Rooney, P. Biol., Kristen Vinke, P.Biol, and Jeremy Phelan, CEPIT of Summit. The strategy was to assess as many representative sites as possible in order to gather enough information to adequately assess each of the previously delineated ESA areas. A 'representative site' is one that is typical or average for a given area, in terms of natural features types (badlands, watercourse, wetland, coulee, forest, etc.), disturbances and vegetation health. The total number of representative sites within each of these areas (generally of the same ESA) was roughly proportionate to the size of that area or the extent of areas with similar features and conditions throughout the County.

Prior to the field work, a general plan was made to determine sites for field-truthing and access routes. This preliminary selection of representative sites was based on natural feature types identified in the air photos, the Ducks Unlimited waterfowl concentration map, and comments in the public consultation document (McFarlane pers. comm.. 2009). Specific site assessment locations were modified in the field based on observations of natural features and site conditions, site access, property access restrictions, and efficiency (i.e. to see as many representative sites as possible while minimizing travel time). Special areas, such as provincial parks and Ducks Unlimited managed wetlands were also selected for site assessment.

At each site, representative plots of approximately 20 x 20 meters were inspected. Field data forms were filled out at a subset of the selected representative sites (Appendix A), while additional anecdotal observations were recorded on the field map book as required. Additional sites were informally assessed (no field data forms) and noted in the map book to help determine how far the information from the representative sites could be extrapolated. The plant species checklists on the data forms were compiled from common species of the three natural subregions that traverse the County (Natural Regions Committee 2006) and a weed survey within the County (Alberta griculture and Rural Development 2009). The information recorded at each site included the following:

- Location description and site UTM (Universal Transverse Mercator) Easting and Northing, location in NAD83 (North American Datum),
- Site name,
- Natural feature type(s) (e.g. wetland, mixedwood, riparian habitat, grassland etc.),
- Comments on observations such as grazing pressure, wildlife observations, slope stability, etc.,
- Photo documentation,
- A site sketch,
- General vegetation health (stressed, fair, healthy, very healthy),
- Surrounding disturbance types (e.g. agricultural , transportation, residence),
- Wetland classification (if applicable),
- ESA criteria,
- Possible ESA significance,
- Management considerations, and,
- A checklist of observed plant species.

General vegetation health was qualitatively assessed based on the level of disturbance at each site relative to the natural state of that vegetative community (i.e. the subregion and

natural feature type). Vegetation health indicators included total live vegetation cover, diversity of species and age classes, weed and disturbance-caused vegetation abundance, deep-rooted vegetation presence (for riparian areas), bare ground exposure caused by human land uses (e.g., livestock grazing, cultivation, roads, etc), soil compaction, and signs of grazing or browsing by livestock.

Wetlands were classified (Class 1 to 7) based on the Wetland Classification System (Stewart and Kantrud 1971), commonly used in the White Zone of Alberta.

3.5 EVALUATION OF ESAS

The information from the data forms, air photo interpretation and field truthing was compiled to determine the boundaries, natural feature types, criteria and overall descriptions of disturbance and vegetation health of each ESA area. Data collected at each representative site was extrapolated to characterize the ESA polygon. We determined ESA Rank by following the guidelines outlined in Section 2.3.

In general, we combined areas that encompassed the same water body or contained similar natural feature types, and that met the same ESA criteria. In some cases, areas were added or removed from previously mapped ESA areas based on photo interpretation and field-truthing. Most of the newly added areas were judged to contain significant natural features that were in a relatively natural state (i.e. not heavily impacted by agriculture, grazing or development). An ESA that had been identified through the mapping process (Section 3.3) was removed from the ESA mapping if it was an isolated area of less than one square kilometre, and if it was an area that has become degraded since 1991, or it was an area that did not meet Summit's ESA rankings for any other reason(s). Size alone was not considered a sufficient reason to remove an ESA; only those that did not contain any significant features, but were still represented elsewhere in the County (and captured as ESAs) were excluded.

Except where there were significant patches of natural habitat nearby, no cultivated land was included as an ESA, even if these areas were within Alberta Fish and Wildlife's key ungulate areas (Cottonwood Consultants 1991). Because cultivated land is increasing in extent, ESA classification of these areas would be of little value.

3.6 HISTORICAL RESOURCES REVIEW

Arrow Archaeology Limited (Temoin 2008) examined the Historical Resource Values for Kneehill County for both recorded sites and unrecorded sites that have historical resource potential. Specifically, they examined all legally described lands within the County, assigned Historical Resource Values (HRVs), classified them, and listed and mapped the recorded sites within them (if any). They defined the HRVs and indicated site types.

For this review, Arrow Archaeology primarily consulted archival data (such as previously completed historical assessments) and both published and unpublished archaeological and palaeontological literature and reports, including the *Listing of Historic Resources* (Alberta Culture and Community Spirit 2008). Arrow Archaeology also examined remotely sensed data, topographic and geological maps, other biogeophysical data available for the County, and existing land disturbances to assess the potential nature and extent of historical resources.

To identify potential historical resource sites, Arrow Archaeology (Temoin 2008) considered such factors as the location of exposures and/or depth of burial of fossiliferous bedrock, local geomorphological conditions that may contribute to the preservation of historical resources, and other factors that help preserve or destroy historical resources. These investigations focused on lands immediately adjacent to areas with known HRV, and along major drainages such as the Red Deer and Rosebud Rivers and Lonepine, Ghostpine and Spruce Creeks, as well as other sensitive areas such as the Drumheller Badlands and native grasslands. Although Arrow Archaeology's investigations did not require any fieldwork, their personnel have done archaeological research in the County in the past, and are therefore knowledgeable about the general landscape and environment of

Kneehill County. Arrow Archaeology examined the provincially-designated HRVs for all lands in Kneehill County and compared the province's HRV rankings with internally plotted data and other data sets.

Arrow updated the archaeological assessment in Kneehill County, which covers several Borden Block (10 minute by 10 minute) areas within which historical sites are designated. Arrow Archaeology reviewed all the site data for all the Borden Blocks that intersect Kneehill County and determined, to the extent possible, whether those sites are extant, whether they have been destroyed by development, or whether they have been completely or partially mitigated (that is excavated or otherwise examined).

Kneehill County has significant areas with potential to contain important paleontological locales and material. For the most part, paleontological locales are located on slopes where development is very unlikely to occur.

The historical resources summary report (Appendix D) includes the final map showing known extant sites, provincial HRV rankings, and developed historical resource polygons (mapped and delineated using UTM points) along with supporting text, maps and recommendations. Due to the need to protect sites from damage by looting and other impacts, and Arrow Archaeology's confidentiality agreements with the Province of Alberta, the exact position of recorded historical resources within Kneehill County cannot be disclosed. It should also be noted that some of the locations on existing data sets may be inaccurate because they were recorded with insufficient data and information. Arrow Archaeology has, however, checked location information where possible and corrected obvious location/plotting problems.

Summit included the results of the Historical Resources Report into the ESA information (Criteria #12) where possible (Temoin 2008). However, due to the large number of historical features within Kneehill County, not all the historical resources were captured in ESAs.

4.0 PHYSICAL SETTING

The following sections provide a brief overview of the general physical setting of Kneehill County (Section 4.1), including four major subwatersheds of the Red Deer River, and three natural subregions. This is followed by a brief overview of wildlife and vegetation found in the County (Section 4.2), and a more detailed description of natural features (including wildlife and vegetation) that characterize the three natural subregions.

4.1 GENERAL PHYSICAL SETTING

Kneehill County covers approximately 815,000 acres and is located in south-central Alberta (Figure 4.1). Topographically, most of the County is fairly level with sections of rolling topography or hummocky terrain. The eastern border has much rougher terrain including large coulees and badlands. The landscape has been largely shaped by glacial and fluvial processes, creating moraines, lake basins, coulees, badlands and some areas of sand dunes and outwash sands and gravels along the western border (Cottonwood Consultants 1991). Elevations range from about 970 m (3,200 feet) above sea level on the summit of the Knee Hills, to 700 m (2,300 feet) along the Rosebud and Red Deer River Valleys in the south (Cottonwood Consultants 1991). Watercourses are a natural feature of Kneehill County, where four major subwatersheds drain into the Red Deer River: Ghostpine Creek, Threehills Creek, Kneehills Creek, and Rosebud River.

Kneehill County contains natural areas of local, provincial, national and international significance within each of the three natural subregions: Central Parkland in the north and central portions, Northern Fescue in the south and east and Foothills Fescue in the south and west, with a small strip extending into the north east portion of the County. Prominent natural features in the Central Parkland Subregion include remnant aspen forests and shrublands that are most abundant in low wet areas with hummocky till or eolian materials, wetlands in low lying flat areas, rough fescue-dominated grasslands, and coulee slopes along hillsides and creek banks (Natural Regions Committee 2006).

The Northern Fescue Subregion is dominated by plains, rough fescue grasslands and a variety of forbs in remnant native grasslands and coulee slopes, including the extensive rock outcrops of the badlands and deep coulees along the Red Deer River Valley and tributaries in the south and eastern portions of the County. The Fescue Subregion is dryer than Central Parkland; wetlands, aspen forest stands and shrublands are limited to river valleys and depressions in hummocky terrain. Wetlands in this natural subregion are mostly temporary.

The portion of the Foothills Fescue Subregion in Kneehill County is characterized by undulating plains and grasslands dominated by mountain rough fescue (*Festuca saximontana*). There are some open water and wetland areas in this subregion, but they are very uncommon (Natural Regions Committee 2006).

Much of the natural landscape in Kneehill County has been converted due to agriculture, roads, oil and gas development, pipelines and livestock activity. However, diverse physiographic features, remnants of native parkland and grassland vegetation, and numerous wet areas give the County significant environmental value. All natural features (e.g. grasslands, badlands, watercourses, wetlands, forests, coulees, etc) have the potential to protect species diversity, provide wildlife habitat and migration corridors and/or provide vital hydrological function. Many of these areas also have intrinsic appeal by providing scientific, historical and recreational value.

Figure 4.1 Location of natural subregions and main watersheds of Kneehill County.

4.2 WILDLIFE AND VEGETATION

4.2.1 Wildlife

Within Kneehill County, there are 19 species of conservation concern (listed federally or provincially), 13 of which are birds, arthropods, amphibians, fish and insects (Table 4.1).

A search of the Sustainable Resource Development Fisheries and Wildlife Management Information System (FWMIS) identified 21 fish species that occur in the waterbodies within Kneehill County (ASRD 2008b; Appendix B).

Wildlife observations and evidence of wildlife (e.g. beaver runs, deer beds, scat, etc.) were recorded during the field assessments (Table 4.2). No species listed under the provincial *Wildlife Regulations* or the federal *Species at Risk Act* (SARA) were observed during field surveys, however all have the potential to occur in the County.

Table 4.1 Species of conservation concern and focal species that occur in Kneehill County.

Latin Name	Common Name	G rank†	S rank‡	Wildlife Act Status*	Alberta Wildlife Species '05$^{\Psi}$	SARA status§	Sub regions of Kneehill County
Birds							
Anthus spragueii	Sprague's pipit			Special Concern	Sensitive	Threatened	All
**Athene cunicularia hypugaea*	Western burrowing owl		S2	Endangered	At Risk	Endangered	All
**Buteo regalis*	Ferruginous hawk	G4	S3	Endangered	At Risk	Special Concern	All
Charadrius melodus cricumcinctus	Piping Plover			Endangered	At Risk	Endangered	All
Coturnicops noveboracensis	Yellow Rail			Undetermined	Undetermined	Special Concern	All
Numenius americanus	Long billed curlew			Special Concern	Sensitive	Special Concern	All
***Falco peregrinus*	Peregrine falcon		S3	Threatened	At Risk		Northern Fescue
Arthropods							
Panaus plexippus	Monarch				Sensitive	Special Concern	All

Table 4.1 Species of conservation concern that occur in Kneehill County (continued).

Latin Name	Common Name	G rank†	S rank‡	Wildlife Act Status*	Alberta Wildlife Species '05ψ	SARA status§	Sub regions of Kneehill County
Amphibians & Reptiles							
****Rana pipiens**	Leopard frog	G5	S2S3	Threatened	At Risk	Special Concern	Northern Fescue
Fish							
****Acipenser fulvescens**	Lake Sturgeon	G3G4	S2	Threatened	At Risk	No status	Northern Fescue
****Notropis blennius**	River shiner	G5	S2		Undetermined		Northern Fescue
Insects							
****Satyrium acadicum**	Acadian hairstreak	G5	S2		Undetermined		Northern Fescue
****Ochlodes sylvanoides**	Woodland skipper	G5T5	S2		Undetermined		Northern Fescue
Liverworts							
**Mannia fragrans	Liverwort	G5	S1				Northern Fescue

Table 4.1 Species of conservation concern that occur in Kneehill County (continued).

Latin Name	Common Name	G rank†	S rank‡	Wildlife Act Status*	Alberta Wildlife Species '05$^{\Psi}$	SARA status§	Sub regions of Kneehill County
Vascular Plants							
***Townsendia exscapa*	Low townsendia	G5	S2		May be At Risk		
***Muhlenbergia racemosa*	Marsh muhly	G5	S1		May be At Risk		
***Atriplex powellii*	Powell's saltbush	G4	S1		Sensitive		
***Polygonum polygaloides ssp confertiflorum*	Watson's knotweed	G4G5T3T4	S2		Sensitive		
Vegetation Communities							
***Crataegus rotundifolia / Heracleum lanatum - Urtica dioica - Viola canadensis*	Round-leaved hawthorn / cow parsnip - common nettle - western Canada violet		S1S2				

Source: Fiera Consulting 2009
*Focal species; **Elements of conservation concern
† - Global Rank
‡ - Sub-national Rank
* - Under the Alberta Wildlife Act
$^{\Psi}$ – Under the General Status of Alberta Wild Species Report (2005)
§ - Species At Risk Act Status

Table 4.2 Wildlife observations in Kneehill County during 2009 ESA review

Latin Name	Common Name
Mammals	
Alces americanus	Moose
Antilocapra americana	Pronghorn Antelope
Odocoileus hemonius	Mule Deer
Odocoileus virginianus	White-tailed Deer
Lepus sp.	Rabbit
Castor canadensis	Beaver
Canis latrans	Coyote
Birds	
Accipiter cooperii	Cooper's Hawk
Buteo jamaicensis	Red-Tailed Hawk
Falco sparverius	American kestrel
Ardea herodias	Great blue heron
Asio flammeus	Short eared Owl
Charadrius vociferus	Killdeer
Tringa sp.	Yellow legs
Anas clypeata	Northern shoveler
Anas platyrhynchos	Mallard
Aytha affinis	Lesser scaup
Branta canadensis	Canada Goose
Fulica americana	American coot
Colaptes auratus	Flicker
Bombycilla garrulus	Bohemian waxwing
Carduelis tristis	American Goldfinch
Corvus brachyrhynchos	Crow
Corvus corax	Raven
Hirundo spp.	Swallows
Passer domesticus	House Sparrow
Petrochelidon pyrrhonota	Cliff swallow
Pica pica	Magpie
Poecile sp.	Chickadee
Sturnus vulgaris	European starling
Turdus migratorius	American Robin
Tyrannus tyrannus	Eastern Kingbird
Perdix perdix	Gray Partridge

4.2.2 Vegetation

The Alberta Natural Heritage Information Centre (ANHIC) is a provincial database of identified plants and animals compiled by submissions through Alberta Sustainable Resource Development (ASRD 2007). A search of this database for Kneehill County identified 37 element occurrences (Appendix B) (Alberta Tourism, Parks and Recreation 2008). The majority of occurrences highlighted lichens and mosses present within the County. Lichens and mosses were not surveyed as part of this assessment.

Native vegetation observed during site visits was typical of the Central Parkland, Foothills Fescue and Northern Fescue Natural Subregions (Table 4.3). Several invasive agronomic and weed species were also present at nearly all sites, with the highest densities observed in the agricultural areas west of the badlands. A complete list of the weedy and invasive species existing in Kneehill County is provided in Table 4.4.

Table 4.3 Plant species observed in Kneehill County during 2009 ESA review

Latin Name	Common Name
Trees	
Picea glauca	White Spruce
Populus balsamifera	Balsam Poplar
Populus tremuloides	Trembling Aspen
Shrubs	
Amelanchier alnifolia	Saskatoon Berry
Artemesia cana	Sagebrush
Artemesia sp.	Sage
Betula occidentalis	Water birch
Betula pumila	Dwarf birch
Caragana arborescens	Caragana, Siberian Pea Tree
Cornus stolonifera	Red-osier dogwood
Elaeagnus commutata	Wolf Willow
Juniperus horizontalis	Juniper
Potentilla fruiticosa	Shrubby cinquefoil
Prunus virginiana	Chokecherry
Ribes oxycanthoides	Wild gooseberry
Rosa acicularis	Prickly Rose
Rubus idaeus	Red raspberry
Salix spp.	Willow
Shepherdia argentea	Thorny buffaloberry
Shepherdia canadensis	Canadian buffaloberry
Symphoricarpos occidentalis	Western snowberry

Latin Name	Common Name
Forbs and Sedges	
Glycyrrhiza lepidota	Wild licorice
Grindelia squarrosa	Gumweed
Heracleum maximum	Cow parsnip
Hordeum jubatum	Foxtail
Juncus sp.	Rush
Koeleria macrantha	Junegrass
Ledum groenlandicum	Laborador Tea
Leymus innovatus	Hairy wild rye
Liatris punctata	Dotted blazingstar
Mentha arvensis	Wild mint
Opuntia polyacantha	Plains pricklypear
Phalaris sp.	Reed canary grass
Poa spp.	Bluegrass
Potentilla pensylvanica	Prairie cinquefoil
Ranunculus cymbalaria	Creeping buttercup
Ratibida columnifera	Prairie coneflower
Rubus sp.	Raspberry
Rumex crispus	Curled dock
Scirpus lacustre	Bulrush
Solidago canadensis	Canada goldenrod
Spartina gracilis	Alkali cord grass
Sphaeralcea coccinea	Scarlet mallow
Stipa comata	Needle and thread grass

Table 4.3 Plant species observed in Kneehill County during 2009 ESA review (continued).

Latin Name	Common Name
Forbs/grasses/sedges/herbs	
Achillea millefolium	Yarrow
Agropyron cristatum	Crested wheatgrass
Agropyron trachycaulum	Awned wheatgrass
Aquilegia sp.	Columbine
Arctosaphylus uva-ursi	Bearberry
Argentina anserina	Silverweed
Artemesia canadensis	Plains wormwood
Artemesia ludoviciana	Prairie sagewood
Artemisia frigida	Pasture sage
Aster conspicuus	Showy aster
Aster sp.	Aster
Astragalus sp.	Milkvetch
Beckmannia syzigachne	Sloughgrass
Bouteloua gracilis	Blue grama
Calamagrostis canadensis	Marsh reed grass
Campuanula rotundifolia	Harebell
Carex spp.	Sedge
Chenopodium capitatum	Strawberry blite
Cicuta maculata	Water hemlock
Deschampsia cespitosa	Tufted hairgrass
Eleocharis sp.	Spikerush
Elymus glaucus	Smooth wild rye
Elymus trachycaulus	Slender wheatgrass
Erigeron sp.	Fleabane
Galium boreale	Northern bedstraw
Galium triflorm	Sweet-scented bedstraw

Latin Name	Common Name
Thalictrum venulosum	Veiny meadow-rue
Trifolium repens	Dutch clover
Typha latifolia	Cattail
Urtica dioica	Common stinging nettle
Vicia americana	Wild vetch
Weeds	
Axyris amaranthoides	Russian pigweed
Bromus inermus	Smooth brome
Bromus tectorum	Downy brome
Chenopodium alba	Lamb's quarters
Cirsium arvense	Canada thistle
Convolvulus arvensis	Bindweed
Descurainia sophia	Flixweed
Galeopsis tetrahit	Hempnettle
Helianthus maximilianni	Sunflower
Lappula echinata	Bluebur
Linaria vulgaris	Toadflax
Medicago sativa	Alfalfa
Melilotus alba	White sweet clover
Melilotus officinale	Yellow sweet clover
Salsola pestifer	Russian thistle
Sisymbrium spp.	Mustard
Sonchus asper	Annual sow thistle
Tanacetum vulgare	Tansy
Taraxacum officinale	Dandelion
Thlaspi arvense	Pennycress
Tragopodon dubius	Goat's beard

Table 4.4 Weedy and invasive species in Kneehill County

Common name	Latin name	Status[1]
Annual sow thistle	*Sonchus oleraceus*	Nuisance
Ball mustard	*Neslia paniculata*	Nuisance
Bluebur	*Lappula echinata*	Nuisance
Blueweed	*Echium vulgare*	Noxious
Canada thistle	*Cirsium arvense*	Noxious
Cleavers	*Galium aparine and Galium spurium*	Noxious
Common chickweed	*Stellaria media*	Nuisance
Common dandelion	*Taraxacum officinale*	Nuisance
Common tansy	Tanacetum vulgare	Noxious
Common toadflax	*Linaria vulgaris*	Noxious
Cow cockle	*Saponaria vaccaria*	Nuisance
Dalmation Toadflax	*Linaria dalmatica*	Nuisance
Dog mustard	*Erucastrum gallicum*	Nuisance
Downy Brome	*Bromus tectorum*	Nuisance
Field bindweed	*Convolvulus arvensis*	Noxious
Flixweed	*Descurania sophia*	Nuisance
Green foxtail	*Setaria viridis*	Nuisance

Common name Cont'd	Latin name Cont'd	Status[1] Cont'd
Hemp-nettle	*Galeopsis tetrahit*	Nuisance
Leafy Spurge	*Euphorbia esula*	Noxious
Night-flowering catchfly	*Silene noctiflora*	Nuisance
Oxeye Daisy	*Chrysanthemum maximum*	Noxious
Perennial sow thistle	*Sonchus arvensis*	Noxious
Quack grass	*Agropyron repens*	Nuisance
Red-root pigweed	*Amaranthus retroflexus*	Nuisance
Round-leaved mallow	*Malva rotundifolia*	Nuisance
Russian Thistle	*Salsola kali*	Nuisance
Scentless Chamomile	*Matricaria perforata*	Noxious
Stinkweed	*Thlapsi arvense*	Nuisance
Tartary buckwheat	*Fagopyrum tartaricum*	Nuisance
White cockle	*Lychnis alba*	Noxious
Wild buckwheat	*Polygonum convolvulus*	Nuisance
Wild mustard	*Brassica kaber*	Nuisance
Wild oat	*Avena fatua*	Nuisance

1 Government of Alberta 2008

4.3 NATURAL FEATURES

Five major natural features that characterize the three natural subregions in Kneehill County were identified in the field. These natural features each meet one or more of the criteria used to differentiate and rank the ESAs. The functions and locations of these features in the County are summarized below.

4.3.1 Waterbodies

Rivers, Creeks and Streams

Rivers, creeks and streams serve a vital hydrological function and can support many wildlife groups, including waterfowl, fish, and invertebrate species. Kneehill County is located within the Red Deer River watershed, with four subwatersheds: Ghostpine, Threehills, Kneehills, and Rosebud (Aquality 2009). The banks and riparian habitats of these waterbodies range from heavily disturbed with stressed vegetation, to lightly disturbed with very healthy vegetation (more information on riparian areas below). Most of the drainages to the major tributaries are intermittent and the upper-most reaches frequently contain grazed or cultivated areas. Aquatic vegetation includes marsh type grasses, rushes and sedges along edges of permanent streams and species typical of ephemeral to seasonally wetted streams in the dry drainages entering the main tributaries.

Threehills Creek Subwatershed

The Threehills Creek Subwatershed includes Threehills Creeks and its tributaries. It is the largest of the three subwatersheds in Kneehill County and includes two dams creating the Bigelow and Braconnier Reservoirs (Aquality 2009).

Threehills Creek Subwatershed is primarily affected by feedlots and intensive livestock operations (numbering over 60) resulting in cattle densities ranging between 0.21 – 0.60 cattle/ha (Aquality 2009). Croplands account for approximately 60 – 80% of total land cover in the watershed, and only those areas in the northern and eastern borders of Kneehill county

experience lower cropland usage, on account of their hazardous terrain and predominance of wetland/low lying areas which are more difficult to cultivate (Aquality 2009).

Oil and gas activity and road infrastructure also contribute to impacts within the watershed, with highest well densities at 10 wells/km^2, and over 100 bridges/culverts crossing waterbodies in the subwatershed (Aquality 2009).

The headwaters of the Threehills Creek Subwatershed is primarily a groundwater recharge area, whereas further downstream, the subwatershed becomes a groundwater discharge area (Stantec Consulting Ltd. 2005).

In the '*State of the Watershed*' report (Aquality 2009), the Threehills Creek Subwatershed is ranked as "poor" according to a number of condition indicators (including wetland loss, linear development, nutrients, bacteria, pesticides and land cover) and "medium" according to risk indicators (including livestock manure production, urban, rural, agricultural and recreational developments, and oil/gas wells). The primary areas of concern were cited to be nutrient concentrations exceeding water quality guidelines (likely a reflection of compromised riparian areas, agricultural runoff, natural inputs from surrounding soils, and other runoff sources) and the loss of wetlands and general conversion of the land use from its natural grassland dominance to a cropland/agricultural use (Aquality 2009, Madaskwa 2004).

Ghostpine Creek Subwatershed

Ghostpine Creek subwatershed consists of Ghostpine Creek and its tributaries. The main source of water comes from Pine Lake, located north of Kneehill County in Red Deer County. Ghostpine Creek is a tributary to Threehills Creek, and does not contain any other named tributaries.

Ghostpine Creek Subwatershed is primarily affected by feedlots and intensive livestock operations resulting in cattle densities ranging between 0.21 – 0.60 cattle/ha (Aquality 2009).

The subwatershed experiences some of the higher manure outputs (2.6-5.0 tonnes/ha) as compared to the rest of the County. Croplands account for approximately 60 – 80% of total land cover in the watershed, and only those areas in the northern and eastern borders of Kneehill county experience lower cropland usage, on account of their hazardous terrain and predominance of wetland/low lying areas which are more difficult to cultivate (Aquality 2009).

Oil and gas activity and road infrastructure also contribute to impacts within the watershed, with highest well densities at 10 wells/km^2, and over 100 bridges/culverts crossing waterbodies in the subwatershed (Aquality 2009).

A unique feature of the Ghostpine Creek subwatershed is the greater than 100 freshwater springs located near the Town of Trochu (Aquality 2009). This has resulted in the formation of several wetlands in this area, an area of importance to the waterfowl in the area.

In the '*State of the Watershed*' report (Aquality 2009), Ghostpine Creek is included in the overall assessment of the Threehills/Ghostpine watershed. As such, the overall ranking of the watershed was determined to be "poor" as discussed above.

Kneehills Creek Subwatershed

Kneehills Creek Subwatershed covers the most amount of area within Kneehill County, second only to Threehills Creek Subwatershed (Aquality 2009). The subwatershed includes Kneehills Creek, Spruce Creek, and Lonepine Creeks within Kneehill County and contains the Grainger Dam and the Fyten Reservoir, both located in the southwestern corner of the County.

Kneehills Creek Subwatershed has an even higher predominance of feedlots/intensive livestock operations than Threehills Creek Subwatershed, numbering over 100, resulting in cattle densities peaking between 0.80 – 1.00 cattle/ha (Aquality 2009). Croplands account for approximately 60 – 80% of total land cover in the majority of watershed, but a concentrated area around Acme/Linden rises to 80-100% (Aquality 2009).

Oil and gas activity and road infrastructure also contribute to impacts within the watershed, with well densities averaging 1.87 wells/km^{e} and peaking at 10 wells/km^{2}, and 320 bridges/culverts crossing waterbodies within the subwatershed (Aquality 2009). There are significantly fewer freshwater springs in the Kneehills Creek Subwatershed, numbering less than 10 (Aquality 2009).

The '*State of the Watershed*' report (Aquality 2009), the Kneehills Creek Subwatershed is ranked as "poor" according to a number of condition indicators (including wetland loss, riparian health, linear development, nutrients, bacteria, and land cover) and "medium" according to risk indicators (including livestock manure production, urban, rural, agricultural and recreational developments, and oil/gas wells). Overall, the Kneehill Creek Subwatershed received a lower ranking than the Threehills Creek Subwatershed. The primary areas of concern were cited to be nutrient and fecal coliform concentrations exceeding water quality guidelines (likely a reflection of compromised riparian areas, agricultural runoff, and other runoff sources), the loss of wetlands and general conversion of the land use from its natural grassland dominance to a cropland/agricultural use, and the high oil/gas well density, which represents a high risk to aquatic resources (Aquality 2009).

Rosebud River Subwatershed

Rosebud River Subwatershed covers the smallest amount of area within Kneehill County, located in the very southern section of the County (Aquality 2009). The subwatershed includes Rosebud River and its tributaries within Kneehill County, and does not contain any dams.

There are only 25 feedlots/intensive livestock operations in the Rosebud River Subwatershed, and cattle densities are proportionately low, ranging between 0.0 – 1.00 cattle/ha (Aquality 2009). Croplands account for approximately 60 – 80% of total land cover in the majority of watershed (Aquality 2009).

Oil and gas activity and road infrastructure also contribute to impacts within the subwatershed, with well densities averaging 2.42 wells/km^{e} and peaking at 10 wells/km^{2}, and 541 bridges/culverts crossing waterbodies within the subwatershed (Aquality 2009). Only a small portion of this activity occurs within Kneehill County.

In the '*State of the Watershed*' report (Aquality 2009), the Rosebud River Subwatershed is ranked as "fair" according to a number of condition indicators (including wetland loss, riparian health, linear development, nutrients, bacteria, pesticides and land cover) and "medium" according to risk indicators (including livestock manure production, urban, rural, agricultural and recreational developments, and oil/gas wells). Overall, the Rosebud River Subwatershed received the same ranking as the Threehills Creek Subwatershed. The primary areas of concern were cited to be nutrient concentrations exceeding water quality guidelines (likely a reflection of compromised riparian areas, agricultural runoff, and other runoff sources) and the loss of wetlands and general conversion of the land use from its natural grassland dominance to a cropland/agricultural use.

Wetlands and Lakes

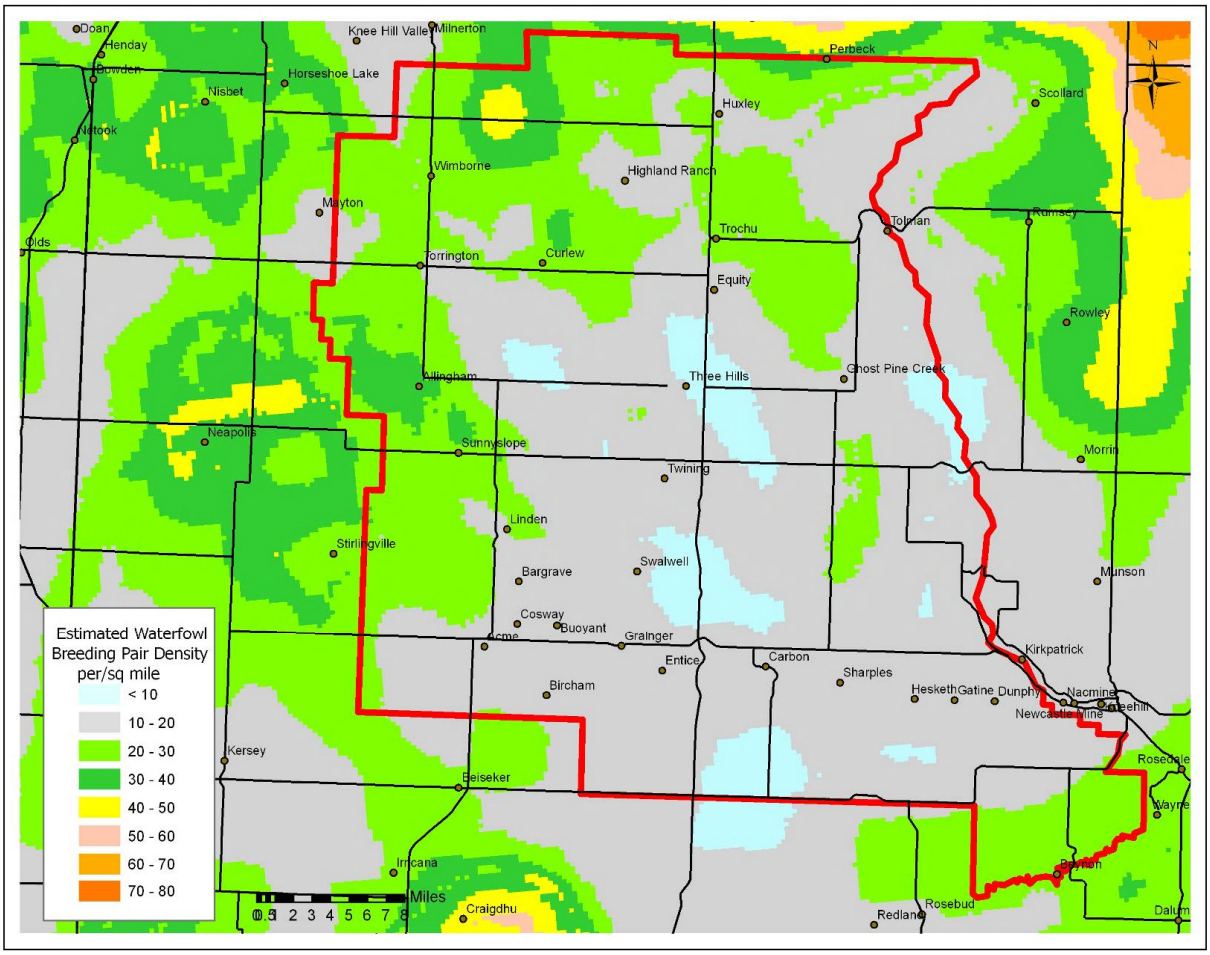
Wetlands and lakes are important waterfowl, amphibian and fish habitats, and provide vital hydrological and environmental functions such as aquifer recharge, flood mitigation and water filtration. They also generally have high plant diversity. In Alberta, these habitats are remnants of a once larger ecosystem that is disappearing largely due to drainage, in-filling and cultivation.

Wetlands are mostly concentrated in the northern and middle to north-western portions of Kneehill County. These locations roughly correspond to the maps showing areas of highest waterfowl density in the County (McFarlane pers. comm. 2009)) (Figure 4.2). Several scattered patches of low lying and poorly-drained land and depressions in hummocky terrain create wetlands that include Classes 1 to 6 (Stewart and Kantrud 1971). Alkali ponds (Class 6) were observed in the middle to north-western portion of the County.

Wetlands are rare in the southern portions of the County (the Northern Fescue and Foothills Fescue Subregions). The wetlands here are mostly ephemeral, temporary or seasonal (classes 1 through 3). However, in the far south eastern area (Northern Fescue Subregion), there are a few semi-permanent to permanent ponds and lakes (classes 4 and 5) wetlands.

Many of the ephemeral draws are cultivated or grazed, and many of the semi-permanent or permanent wetlands are disturbed along their banks and have no native upland vegetation. However, there also are several productive wetlands that support waterfowl and have distinct wetland riparian zones including upland native vegetation. Some of the larger permanent wetlands, such as the Fyton Reservoir, and the Ducks Unlimited-managed Bigelow reservoir, the Cunningham Project and the Heron Project are relatively undisturbed and have high intrinsic value.

In the Central Parkland Subregion, common wetland and surrounding upland plant species on relatively undisturbed sites include cattail, sedge, bulrush, aspen, willow, black and white spruce and silverberry. In the Northern Fescue Subregion, willow, sedge, common cattail and bulrush communities occur in poorly drained depressions and along rivers and in Foothills Fescue, willow, sedge and tufted hair grass communities occur in poorly drained depressions an along rivers (Natural Regions Committee 2006).



Source: Ducks Unlimited (McFarlane pers. comm. 2009)

Figure 4.2 Estimated waterfowl breeding pair density, indicating important wetland and lake habitats.

4.3.2 Riparian Areas

Healthy riparian areas stabilize banks, serve as buffers that filter overland and subsurface flow, help attenuate floods, and maintain water supply during dry periods. They also provide wildlife corridors and deer habitat and migrating and nesting bird habitat, and can support high species diversity due to the transitional zones from aquatic to terrestrial vegetation. River valley woodland and shrub habitats have become some of the most threatened ecosystems in arid and

semi-arid regions of the world due to heavy grazing, water storage projects, cultivation of bottomlands and stream flow regulation (Johnson et al. 1985; Boldt et al. 1978; Tubbs 1980 as cited in Cottonwood Consultants 1991).

The majority of riparian areas in Kneehill County are shrub-dominated, except for those in the eastern portion of the County where riparian areas are also composed of steep coulees and badlands. The coulee and badland riparian areas are generally the least disturbed, and range from exposed soil with occasional shrubs and grasses, to dense conifer-dominated forests. Throughout the rest of the County, most of the creeks traverse cultivated or grazed land, and consequently, have disturbed and fragmented riparian areas.

Common riparian shrub species include: willow, silverberry (*Eleagnus commutata*), prickly rose, chokecherry, and caragana.

Very few riparian health assessments have been completed on the three subwatersheds in the County. However, the overall state of the watershed suggests that the impacts to the riparian areas within Kneehill County have compromised the areas' functions and led to further impacts to aquatic resources and habitat (Aquality 2009).

4.3.3 Aspen Forest

Aspen forests provide sheltered habitats for deer, birds and other wildlife, and may support significant or self-sustaining populations of rare wildlife species (Cottonwood Consultants 1991). Patches of aspen forest are concentrated in the northern portions of the County. These aspen communities are associated with hummocky terrain in imperfectly drained depressions on medium to fine textured gleysolic soils, where moisture is sufficient to support tree growth throughout the growing season (Natural Regions Committee 2006). In Kneehill County, most of the aspen forests are located in the Central Parkland Subregion and in some of the ravines and river valleys of the Northern Fescue Subregion.

In Kneehill County, common species in aspen forests of the Central Parkland Subregion include aspen, Saskatoon, prickly rose, snowberry, beaked hazelnut (*Corylus cornuta*), bunchberry (*Cornus canadensis*), wild lily-of-the-valley (*Maianthemum canadense*), wild sarsaparilla (*Aralia nudicaulis*), and a variety of forbs and grasses. Species such as hay sedge (*Carex siccata*) and creeping juniper (*Juniperus horizontalis*) make up the understory of aspen stands on sandy, rapidly drained sites. Balsam poplar is often present with aspen and white spruce (*Picea glauca*) on moist, rich sites with lush, diverse understories. In the Northern Fescue Subregion, balsam poplar, aspen and plains cottonwood (*Populus deltoids*) stands are limited to river valleys where groundwater is adequate throughout the growing season. In the Foothills Fescue Subregion, forested patches of balsam poplar, aspen and plains cottonwood occur along rivers on low terraces season (Natural Regions Committee 2006).

4.3.4 Native Grasslands

Native grasslands perform vital ecological functions such as capturing and retaining water and providing rich forage and key habitat for rare plants and animals. The two subregions of grassland in Kneehill County are Northern Fescue and Foothills Fescue. Although most of the County is in the Grassland natural region, the majority of native grasses have been replaced with cultivated land (Natural Regions Committee 2006). Therefore, the flatter areas are dominated by agronomic species, while native grassland species are almost exclusively in remnant natural areas that are unsuitable for cultivation, such as aspen forests in the low-lying areas of hummocky terrain and on the sloped surfaces of coulees and badlands. Nearly all of the natural grassland communities observed during field work were at least lightly grazed and mixed with agronomic and disturbance-tolerant species.

Fescue vegetation is particularly vulnerable to grazing impacts. Many passerine birds depend on ungrazed or very lightly grazed grassland for nesting, especially in the Northern Fescue Grassland Subregion. One of the greatest threats to plains rough fescue habitats appears to be the invasion of smooth brome, especially on moist sites with loamy soils (Natural Regions Committee 2006).

The natural grasslands of the Central Parkland and Northern Fescue Subregions are commonly dominated by plains rough fescue (*Festuca campestris*), western porcupine grass (*Stipa curtiseta*), northern wheatgrass (*Elymus lanceolatus*) or slender wheat grass (*Elymus trachycaulus*), Hooker's oatgrass (*Helictotrichon hooker*i) and perennial herbs. In the Central Parkland Subregion, dryer sites often contain Western porcupine grass, June grass (*Keoleria macrantha*), needle-and-thread grass, blue grama, dryland sedges (*Carex sp.*) and pasture sagewort (*Artemisia cana*), while moister sites generally have more plains rough fescue, slender wheat grass and forb cover (Natural Regions Committee 2006). Other typical grasses in the Northern Fescue Subregion include western wheat grass, needle-and-thread, June grass and blue grama. Sand grass (*Calamavilfa longifolia*) may also occur on the driest sites. Western porcupine grass, plains rough fescue, northern wheatgrass and porcupine grass (*Stipa spartea*) occur on moister sites (Natural Regions Committee 2006).

The Foothills Fescue Subregion is differentiated from the Northern Fescue Subregion by its prevalence of mountain rough fescue, Parry oat grass (*Danthonia parryl*) and bluebunch fescue (*Festuca idahoensis*); shrubby cinquefoil is also common on grazed sites. Dry, steep southwest facing slopes may be sparsely vegetated with creeping juniper, Parry oatgrass, bluebunch fescue and June grass. Mountain rough fescue cover often increases with greater soil moisture. Dry, well drained sites may support mixtures of mountain rough fescue, bluebunch fescue, Parry oat grass and June grass. Common herbs in the Foothills Fescue Subregion include silvery perennial lupine (*Lupinus argenteus*), sticky purple geranium (*Geranium viscosissimum*), three-flowered avens (*Geum triflorum*), pasture sagewort and golden bean (*Thermopsis rhombifolla*) (Natural Regions Committee 2006).

4.3.5 Coulees and Badlands

Badlands, which are larger than coulees, include canyons, ravines, gullies, hoodoos and other erosion-shaped formations. The steep-walled valleys and rugged badlands provide nesting habitat for rare birds of prey, diverse breeding bird habitats and key deer habitat (Cottonwood

Consultants 1991). Plant communities in these areas are diverse because of the unique topography.

In Kneehill County, coulees are concentrated along the southeast portions of the Ghostpine, Threehills, Kneehills, and Rosebud Rivers. Badlands occur along the eastern border and southeast corner of the County and include Drumheller Provincial Park, Tolman Badlands Heritage Rangeland, Dry Island Buffalo Jump Provincial Park, Midland Provincial Park and Horseshoe Canyon. These areas have significant natural, historical and recreational value. In the provincial ESA document (Fiera Biologica Consulting 2009), the Tolman Badlands are considered a site of recognized significance and the Drumheller Badlands are recognized as having rare or unique landforms.

The coulees in Kneehill County range from completely exposed to well-vegetated. The 2009 ESA field surveys found that well-vegetated and relatively undisturbed coulees, such as the Beynon Coulee (an ecological reserve on the Rosebud River) are covered with grasses and forbs on slope sides and white spruce, trebling aspen, balsam poplar, western snowberry, prickly rose, silverberry, willows and pasture sage in depressions and valleys. Generally, the north-facing slopes in the badland areas are covered with grasses and forbs with patches of white spruce-dominated forest. The south aspects are dryer with exposed soil, draught-tolerant shrub species and sparse grasses.

5.0 LEGISLATIVE AND POLICY SETTING

In addition to the physical setting of Kneehill County within the Province of Alberta, there is significant legislation which regulates land-use and management at the Federal, Provincial and Municipal levels. The Legislative setting of Kneehill County will impact the level at which this ESA review can be utilized and applied by the County. Below is an outline of the main Federal, Provincial and Municipal legislation that currently exists that are associated with development or management of lands generally classified as ESAs.

5.1 FEDERAL SETTING

5.1.1 Canadian Environmental Assessment Act

The federal *Canadian Environmental Assessment Act* (CEAA) sets the process and content of environmental assessments and reviews of projects with a federal trigger, such as a *Fisheries Act* Authorization, *Navigable Waters Protection Act* permit or federal funding (Government of Canada 1992). The purpose of the Act is to ensure that environmental effects of proposed projects are considered before other federal decision makers take an action that would allow a project to proceed. Environmental assessments are planning tools used to identify potential effects of a proposed project on the environment. The CEAA is administered by the Canadian Environmental Assessment Agency.

5.1.2 Fisheries Act

The *Fisheries Act* protects fish and fish habitat. Fish habitat is defined as spawning grounds and nursery, rearing, food supply and migration areas on which fish depend directly or indirectly in order to carry out their life processes (Government of Canada 1985). According to the *Act*, "No person shall carry on any work or undertaking that results in the harmful alteration, disruption or destruction (HADD) of fish habitat." The need for safe fish passage, minimum flow requirements, fish guards and screens, destruction of fish, destruction of fish habitat, and the pollution of fish habitat are all addressed within the Fisheries Act and provide a framework for activities that bring up these issues.

The Department of Fisheries and Oceans Canada (DFO) has a management program developed with Operational Statements for works that pose a low risk to fish or fish habitat, such as culvert installation and maintenance, bridge maintenance, temporary stream crossings and beaver dam removal. The Operational Statement for Alberta outlines acceptable practices and measures to protect fish and avoids creating HADDs (Fisheries and Oceans Canada 2009). A DFO review

and possible authorization is required if there is no Operation Statement for a given project or if compliance with the conditions and measures is not possible.

5.1.3 Migratory Bird Convention Act

The *Migratory Bird Convention Act* protects migratory birds and nests from indiscriminate harvesting and destruction (Government of Canada 1994). The Migratory Bird Regulations stipulate that "no person shall disturb, destroy or take a nest, egg, nest shelter, eider duck shelter or duck box of a migratory bird" (Section 6 [a]), and "no person shall deposit or permit to be deposited oil, oil wastes or any other substance harmful to migratory birds in any waters or any area frequented by migratory birds (Section 35 [1]) (Government of Canada 1994). Works that will disturb or destroy nests must be completed outside of the active bird breeding season. The breeding season is approximately April 1st to July 31st.

5.1.4 Species at Risk Act

The *Species at Risk Act* (SARA) is federal legislation that provides legal protection to "at risk" wildlife and their habitats (i.e. wildlife species considered to be extirpated, endangered, threatened, or of special concern). Habitats include "residences" and "critical habitat", for which the definitions are currently being drafted. At-risk wildlife and plants are listed in Schedule 1 of SARA (Government of Canada 2002).

The purposes of SARA are to prevent Canadian indigenous species, subspecies, and distinct populations from becoming extirpated or extinct, and to encourage the management of other species to prevent them from becoming at risk. This protection applies to federal lands in Canada, such as national parks, lands used by the Department of National Defense and reserve lands, and to projects that are reviewed under CEAA. If a species at risk is identified on private or provincial crown land, best management practices and good environmental stewardship are encouraged. Alberta Natural Heritage Information Centre (ANHIC) is the provincial agency

that maintains a database of rare species, including plants and wildlife that are at risk, and their relative locations within the province.

5.1.5 Federal Wetland Conservation Policy

The Federal Policy on Wetland Conservation was implemented to assist Canada in meeting its commitment to the wise use of wetland on federal Crown land (Government of Canada 1991). The main objective of the Federal Government with respect to wetland conservation is to *"promote the conservation of Canada's wetlands to sustain their ecological and socio-economic functions, now and in the future"* (Government of Canada 1991). The Federal Government works in cooperation with all departments and the public to achieve this objective by striving for the following goals:

- Maintenance of the functions and values derived from wetlands throughout Canada;
- No net loss of wetland functions on all federal lands and waters;
- Enhancement and rehabilitation of wetlands in areas where the continuing loss or degradation of wetlands or their functions have reached critical levels;
- Recognition of wetland functions in resource planning, management and economic decision-making with regard to all federal programs, policies and activities;
- Securement of wetlands of significance to Canadians;
- Recognition of sound, sustainable management practices in sectors such as forestry and agriculture that make a positive contribution to wetland conservation while also achieving wise use of wetland resources; and,
- Utilization of wetlands in a manner that enhances prospects for their sustained and productive use by future generations (Government of Canada 1991).

The policy outlines the following seven strategies for the use and management of wetlands

- Developing public awareness,

- Managing wetlands on federal lands and waters and in other federal programs,
- Promoting wetland conservation in federal protected areas,
- Enhancing cooperation,
- Conserving wetlands of significance to Canadians,
- Ensuring a sound scientific basis for policy, and
- Promoting international action.

5.2 PROVINCIAL SETTING

The following subsections outline those provincial acts likely to be of most relevance when reviewing the role of ESAs in Kneehill County. These acts provide a framework through which management recommendations may be implemented.

5.2.1 Agricultural Operation Practices Act

The *Agricultural Operation Practices Act* (AOPA) regulates and enforces policies involving confined feedlot operations and environmental standards for livestock operations (Government of Alberta 2001a). For instance, the Act regulates application, storage and handling of manure, composting materials, or compost, and the construction, maintenance, operation, reclamation and abandonment of seasonal feeding and bedding sites. The Natural Resources Conservation Board administers the Act.

5.2.2 Agricultural Pests Act and Regulation

The *Agricultural Pests Act* and Regulation outlines the definition of pest and nuisance species (including animal, bird, insect, plant or disease) which affect agricultural production in the province (Government of Alberta 1984). The Act also outlines the duties of individuals to manage and control these pests. Municipalities are given the authority to manage native and introduced pests (as listed in the regulations) as required/appropriate. Examples of pests include

black leg, grasshopper and clubroot, while nuisances include coyote, skunk and magpie (Government of Alberta 2001b).

5.2.3 Alberta Land Stewardship Act

The *Land Stewardship Act* (Bill 36) was put in place to implement the Land Use Framework. (Government of Alberta 2009a; 2009b). The goal for the framework is to promote and support planning which results in smart growth within the Province at the environmental, economic and social levels.

The Land-use Framework consists of seven strategies to improve land-use decision-making in Alberta:

1. Develop seven regional land-use plans based on seven new land-use regions (Red Deer Regional Plan to be completed in 2012);
2. Create a Land Use Secretariat and establish a Regional Advisory Council for each region;
3. Cumulative effects management will be used at the regional level to manage the impacts of development on land, water and air. Models and tools to support a cumulative effects approach to development of regional plans have been designed. Work is supporting regional plan development;
4. Develop a strategy for conservation and stewardship on private and public lands. A strategic blueprint will be available for stakeholder consultation in November 2009, with a final strategy completed spring 2010;
5. Promote efficient use of land to reduce the footprint of human activities on Alberta's landscape (strategy to be completed in 2010);
6. Establish an information, monitoring and knowledge system to contribute to continuous improvement of land-use planning and decision-making; and,
7. Inclusion of Aboriginal peoples in land-use planning (Government of Alberta 2009b).

Bill 36 creates the authority for regional plans for each of the seven regions identified in the Land Use Framework. These regional plans define regional economic, environmental and social objectives and are designed to provide context for local plans within the region. Regional plans will integrate provincial energy, environment, water and other policies at the regional level. With the new Act, Albertans will be consulted to help define the future of the region in which they live. It will also make Alberta the first jurisdiction in Canada to compensate landowners whose property values are affected by conservation and stewardship restrictions under regional plans.

The power of the *Land Stewardship Act* and implementation of the Regional Plans legislates that if there are any conflicts between the regional plans and regulations under other Acts, the regional plan will prevail. Provincial and Municipal governments will be responsible for working together to ensure that their legislation, plans, and bylaws align with the Regional Plans in Bill 36. The *Land Stewardship Act* includes related amendments to more than 25 legislative Acts to support regional planning in the province. The amendments provide administrative tools to enable the government to direct planning requirements and processes for the province

5.2.4 Environmental Protection and Enhancement Act

The *Environmental Protection and Enhancement Act* (EPEA) supports and promotes the protection, enhancement and wise use of the environment (Government of Alberta 2000b). The Act allows Alberta Environment (AENV) to develop standards and guidelines and regulations and objectives to protect Alberta's air land an water; it involves Alberta's public to participate in environmental assessment and approval processes and the right to appeal certain AENV decisions to the Environmental Appeals Boards; and through the environmental assessment process, ensures environmental protection is considered in the early stages of planning.

5.2.5 Historical Resources Act

In Alberta, the historical resources are governed by the *Historical Resources Act* (Government of Alberta 2000c). Designation of sites recognizes the significance of historical resources and provides a framework for their protection and preservation. Structures, archaeological sites, palaeontological resources, and other works that are of value for historic, cultural, natural, scientific or aesthetic reasons may be considered historical resources. While there are approximately 300 Provincial Historic Resources in Alberta (owned by the provincial government and functioning as a historic site or museum), thousands of other historical resources are monitored by Alberta Culture and Community Spirit.

The *Historical Resources Act* provides the framework for completing a Historic Resources Impact Assessment (HRIA) for activities that may alter, damage or destroy historic resources.

5.2.6 Soil Conservation Act and Regulation

The *Soil Conservation Act* and *Regulation* outlines the duties and obligations of landholders to protect their land from soil loss and deterioration (Government of Alberta 1988). Authority is given to municipalities to appoint a soil conservation officer, who is responsible for ensuring that deterioration of soils is not taking place, and for issuing notices to landholders in contravention of the Act (Government of Alberta 1988).

5.2.7 Water Act

The *Water Act* places structure and boundaries around the conservation and management of water (Government of Alberta 2000a.) It governs the diversion, allocation, and use of water for household, licensable, and traditional agricultural purposes to protect Alberta's rivers, streams, lakes, and wetlands. Regulation and enforcement is in place for managing water and water use, the aquatic environment, fish habitat, and in-stream construction practices. The Code of Practice regulates activities under the *Water Act*, which includes pipeline and telecommunication lines crossing a water body and other watercourse crossings. Permits and

approvals are carried out through Alberta Environment. Public consultation is a key component of the development of these plans and includes opportunities for local and regional involvement.

5.2.8 Water for Life

Water for Life is the province of Alberta's strategy for a coordinated and effective approach to water management that outlines specific strategies and actions to address the province's water issues (Alberta Environment 2003). The *Water for Life* strategy is based on three key goals, or outcomes, as follows:

1. Save, secure drinking water supply,
2. Healthy aquatic ecosystems, and
3. Reliable, quality water supplies for a sustainable economy.

The Alberta Water Council has recently released its third review of implementation progress of the province's *Water for Life* strategy (Alberta Water Council 2009). The review is done in the spirit of adaptive management, where regular review serves to help the strategy remain relevant and focused on current and emerging water issues.

Current Provincial Wetland Policy

The province of Alberta owns the water in permanent wetlands and water bodies through the *Water Act* (Government of Alberta 2000a). Therefore, the province governs any activity that may affect wetlands. The objective of Alberta's wetland policy for *Wetland Management in the Settled Area of Alberta* (Alberta Water Resources Commission 1993b) is to sustain the social and environmental benefits that functioning wetlands provide. The policy's intent is to

- conserve slough/marsh wetlands in a natural state,
- mitigate degradation or loss of slough/marsh wetland benefits as near to the site of disturbance as possible, and

- enhance, restore or create slough/marsh wetlands in areas where wetlands have been depleted or degraded.

An approval from Alberta Environment is required to disturb, drain or fill in a wetland. Developers and individuals that are approved to disturb wetlands will need to develop a wetland mitigation plan. In cases where development of a wetland cannot be avoided, the *Provincial Wetland Restoration/Compensation Guide* directs land-users through options to restore previously disturbed wetlands, as compensation for this development (Alberta Environment 2007).

Future Provincial Wetland Policy

Alberta's New Wetland Policy is currently being reviewed by the Alberta Government (2009). The new wetland policy outlines a number of strategies for mitigating and managing impacts to wetlands, based on the Alberta Water Council's (AWC) *Recommendations for a New Wetland Policy (*Alberta Water Council 2008). This policy will replace the 1993 *Wetland Management in the Settled Area - An Interim Policy* (Alberta Water Resources Commission 1993b) and *Beyond Prairie Potholes - A Draft Policy for Managing Alberta's Peatland and Non-Settled Area Wetlands (*Alberta Water Resources Commission 1993a), and provides a comprehensive policy for the entire province. The new policy will include

- Both the White (public and private settled lands) and Green (forested, public lands) Areas,
- All natural wetland described in the Canadian Wetland Classification Systems (bogs, fens, swamps, marshes, and shallow open water) (National Wetlands Working Group 1997),
- Types 1 through 7 of the Wetland Classification System (Stewart and Kantrud 1971), and

- All restored natural wetlands and wetlands that were constructed or enhanced for the purposes of wetland mitigation (Aquality 2009).

The goal of the new Alberta Wetland Policy is to maintain wetland areas in Alberta, to maintain the ecological, social, and economic benefits that wetlands provide, thereby helping to ensure that Albertans have healthy watershed that provide safe and secure drinking water supplies, healthy aquatic ecosystems, and reliable, quality water supplies for a sustainable economy. In recognition of the high rates of wetland loss in some watersheds, this policy also encourages Albertans to be proactive in increasing wetland area.

To deal with Alberta's conflicting demands of wetland preservation and economic, political and social pressures for development, the province is also developing a Wetland Mitigation Decision Framework (WMDF), which outlines mitigation options for proposed actions that could impact a wetland. Any activities impacting a wetland under the Canadian Wetland Classification or Stewart and Kantrud's Wetland Classification Systems are subject to the Water Act, with the exception of ephemeral water bodies (Class 1 under Stewart and Kantrud 1971).

Additionally, The AWC has developed an implementation plan outlining strategies and actions to achieve each outcome specified under the new Wetland Policy (Alberta Water Council 2009). This document is intended to guide planning, policy, and management decisions.

5.2.9 The Wildlife Act

The Alberta *Wildlife Act* governs the management of wildlife and the hunting and trapping of wildlife in the Province (Government of Alberta 2000d). The Government of Alberta has authority for the protection and management of wildlife on all provincial lands. The *Wildlife Act* enables the Minister responsible for fish and wildlife management to establish regulations, "*…respecting the protection of wildlife habitat and the restoration of habitat that has been altered, and enabling the Minister to order persons responsible for the alteration to restore the*

habitat and to charge them with the cost of it if they have failed to effect the restoration" (ASRD 2001).

The Wildlife Regulation prohibits the willful molestation, disturbance or destruction of a house, nest or den of a prescribed wildlife or a beaver dam in prescribed areas and at prescribed times (*Wildlife Act*, Section 38(1)) (Government of Alberta 1997). This regulation applies to

- The nests and dens of
    - Wildlife animals that are endangered animals, throughout Alberta and throughout the year,
    - Migratory game birds, migratory insectivorous birds and migratory nongame birds as defined in the migratory birds convention act (Canada), throughout Alberta and throughout the year, and
    - Snakes, except prairie rattlesnakes, and bats, throughout Alberta and from September 1 in one year to April 30 in the next;
- The dens of prairie rattlesnakes used as hibernacula, throughout Alberta and throughout the year;
- The houses and dens of beaver, on any land that is not privately owned land described in Section 1(1)(m)(i) or (ii) of the act throughout the year;
- The houses, nests and dens of all wildlife in a wildlife sanctuary throughout the year; and,
- The nests of game birds, in a game bird sanctuary throughout the year.

The list of endangered species, controlled animals, bird sanctuary locations, and other information to determine which species and locations the regulation applies to are included in the *Wildlife Act*'s Wildlife Regulation (Government of Alberta 1997).

The provincial government pays particular attention to wildlife species that may be at risk of extinction. Alberta has been involved in programs to identify and restore species at risk for more than 25 years. A document titled Alberta's Strategy for the Management of Species at

Risk (2009 – 2014) provides a framework for species at risk management in Alberta, providing Alberta government staff, recovery teams, advisory committees, project partnerships, and other Alberta citizens' broad management strategies for species at risk in the province (ASRD 2008a). The document directs Alberta government staff involved in species at risk management by helping understand species at risk program processes, priorities and activities.

5.2.10 Weed Control Act

The *Weed Control Ac*t designates the legislation surrounding noxious and nuisance weeds and their management and handling in the province (Government of Alberta 2008). Weeds are invasive species that most often have adapted to habitats that have been disturbed, and as a result, quickly become established and out-compete native species. In a wetland, disturbance may be in the form of changes in the regime of water level fluctuations (e.g., result of flood control measures), while in uplands, disturbance may include clearing native vegetation and exposing soil. Construction, development and increased access also provide opportunities for the introduction of non-native species through inadvertent transport of plant fragments (MacQuarrie and Lacroix 2003; MacFarlane et al. 2003; White et al. 1993).

Potential ecological impacts of invasive plants include

- Changes in nutrient cycling;
- Changes to mineral and soil substrates;
- Hybridization with native species;
- Reduction of species diversity due to monoculture growth;
- Changes in wildlife composition (especially birds); and,
- Changes to the fire regime.

5.2.11 Municipal Government Act

The *Municipal Government Act* forms the basis of operations of local governments including municipalities, cities, towns, and villages (Government of Alberta 2000e). The Act outlines the powers, duties and functions within municipal governments, and outlines the framework for

bylaw development. The *Municipal Government Act* provides municipalities with authority to regulate water on municipal lands, to manage private land to control non-point sources, and to ensure that land use practices are compatible with the protection of aquatic environments.

5.3 KNEEHILL COUNTY SETTING

5.3.1 Municipal Development Plan Bylaw

The 2005 Kneehill County Municipal Development Plan (MDP) Bylaw 1507 is a policy document that addresses such issues as future land use and development in the municipality, the provision of municipal services and facilities, and inter-municipal issues such as future growth areas and the co-ordination of transportation systems and infrastructure (Kneehill County 2005). The MDP provides the means whereby immediate situations or proposals can be evaluated in the context of a long range plan.

5.3.2 Land Use Bylaw

The Kneehill County Land Use Bylaw 1564 regulates and controls the use and development of land and buildings within the municipality to achieve orderly and economic development (Kneehill County 2008). Part VII outlines general land use regulations, including regulations for developments on floodplains and near water.

6.0 UPDATED ENVIRONMENTALLY SIGNIFICANT AREAS

6.1 SUMMARY OF ESA CHANGES

The updates that Summit made to the original ESAs (Cottonwood Consultants 1991) resulted in identifying new significant areas, changing ESA names and ranking ESAs based on their significance (Section 2.3), and refining ESA boundaries that resulted in a reduction of the total ESA area identified in the County (Figure 6.1). Cottonwood Consultants (1991) ranked ESAs as having regional, provincial, national or international significance, but they may have

excluded locally significant areas or areas that are partly degraded. Many of these areas have now been included in the updated definitions of ESA-3 and -4 (Section 2.3). As a result of the review, a previously un-defined area (Perbeck ESA) was designated as an ESA because of its unique characteristics within the County. It is possible that this area was not captured previously due to its slightly fragmented nature.

To simplify and maintain naming consistency, Summit modified ESA names from those used in 1991 to reflect each major creek drainage (Table 6.1). The Drumheller and Tolman badlands and the newly added Perbeck ESA in the northeast are exceptions because of their lack of connectivity to a defined waterbody, and/or because of only minor changes to the original boundaries.

The new ESA located in the northeast portion of the County was named Perbeck after a public consultation and presentation to Council in April and June 2010 did not result in any recommendations being brought forward. The name Perbeck comes from the name of an old hamlet that used to be located in the middle of the significant area. At one time this hamlet had a mail deliver operating with the nearby hamlet of Huxley. Originally, the hamlet was named Purbeck after a town in the County of Dorset, England.

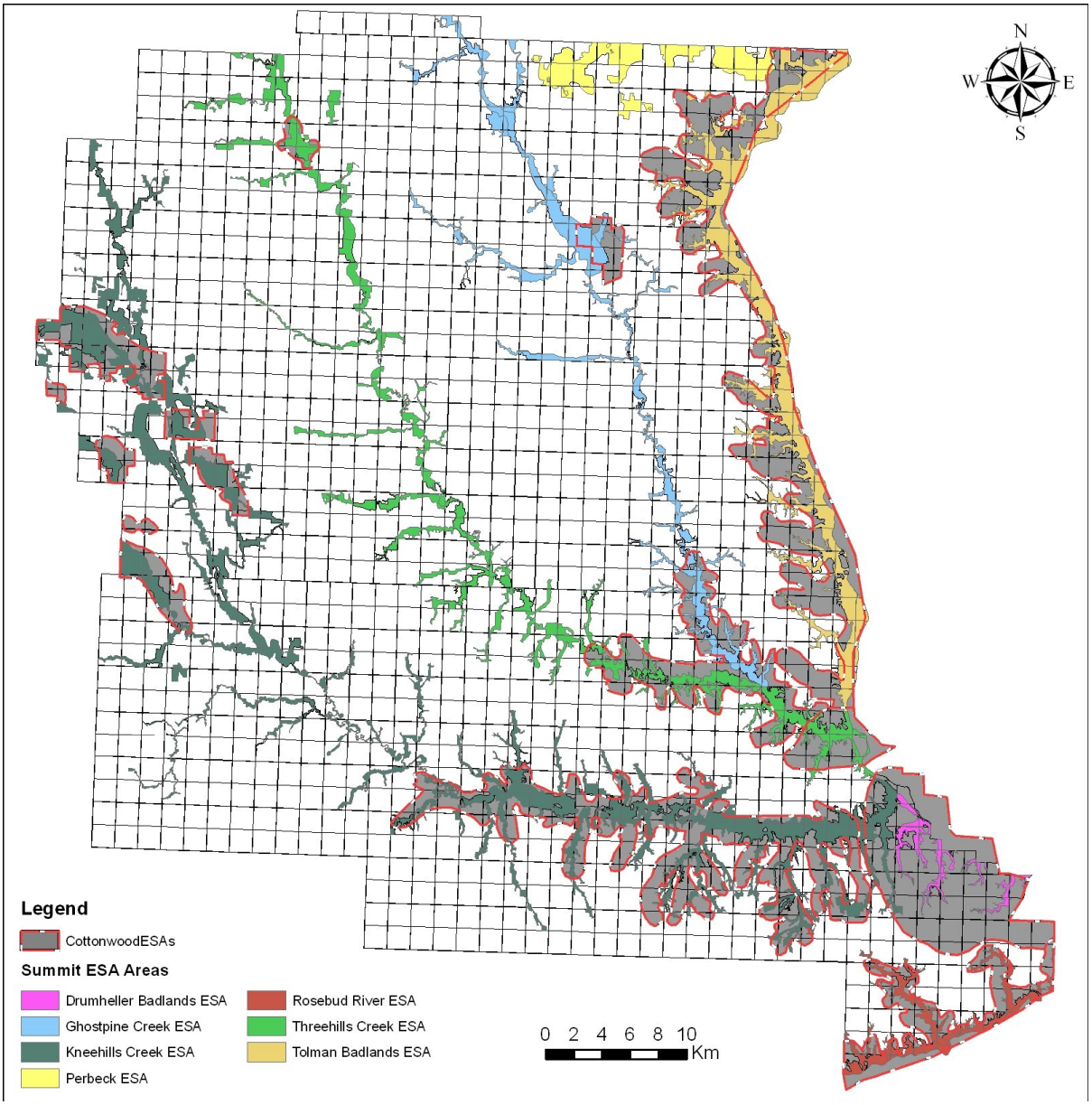


Figure 6.1 Comparison of original (1991) and updated (2009) ESAs in Kneehill County.

In total, ESAs cover 13.4% of Kneehill County (Table 6.3). The highest ranked ESAs (ESA-1 and -2) occur mainly along the rivers, creeks and streams of the eastern border and south-eastern corner of the County, where badlands and coulees are prominent (Figure 6.2). Moderately to highly ranked ESAs (ESA-2 and -3) are concentrated along the northern and western portions of the County, where low lying wet areas and hummocky terrain are common. The lowest ranked ESAs (ESA-3 and -4) are most common in the remainder of the County, dominated by relatively flat and cultivated lands. Additional maps of the County showing the updated ESAs are provided in Appendix C.

Amendments to the original ESAs resulted in changes to boundaries and a reduction in total area from 61,887 ha or 18% of the County (Table 6.2; Cottonwood Consultants1991) to 45,857 ha or 13% of the County (Table 6.3). (Figure 6.2).

ESAs identified in 1991 may have been omitted from our assessment if the area

- was not found to be significant, but was included in the 1991 mapping due to limited mapping tools (areas were mapped as ESAs but were not ESAs),
- was not considered significant under the ESA ranking system (Section 2.3), or
- became degraded since 1991 and was no longer considered significant,

For example, many of the upper ends of tributary streams that are mowed or grazed, and do not have surface water, were removed from the ESAs. Most of these exclusions were in cultivated areas west of the badlands and coulees. Those ESAs that were removed due to size may have contained unique features, but these features were represented and thus captured elsewhere in larger ESAs.

Not all significant natural features were captured by the ESA classification, as these features were too small and/or too fragmented to accurately identify and delineate. For instance, there are several scattered wetlands and forested patches in the Central Parkland Subregion, and marshes in the south-eastern corner of the County that are not within a designated ESA. As

well, native grassland areas are so fragmented and while efforts were made to map these areas, exact boundaries may have been missed due to limited field truthing. Native grasslands are important areas for plant and animal species, providing important habitat and seed sourcing. More details on these areas and their management considerations can be found in Section 7.0.

Table 6.1 Comparison of original (1991) and updated (2009) ESA names

Original ESA Name[1]	**Updated ESA Name**
Spruce Creek	Kneehills Creek
Lonepine Creek	Kneehills Creek
Kneehills Creek	Kneehills Creek
Sunnyslope Wetlands	Kneehills Creek
Rosebud River	Rosebud River
Drumheller Badlands	Drumheller Badlands
Bigelow Reservoir	Threehills Creek
Threehills/Ghostpine Creek	Threehills Creek Ghostpine Creek
Trochu Meadow	Ghostpine Creek
Tolman Badlands	Tolman Badlands
(Previously did not exist)	Perbeck ESA

[1]SOURCE: Cottonwood 1991

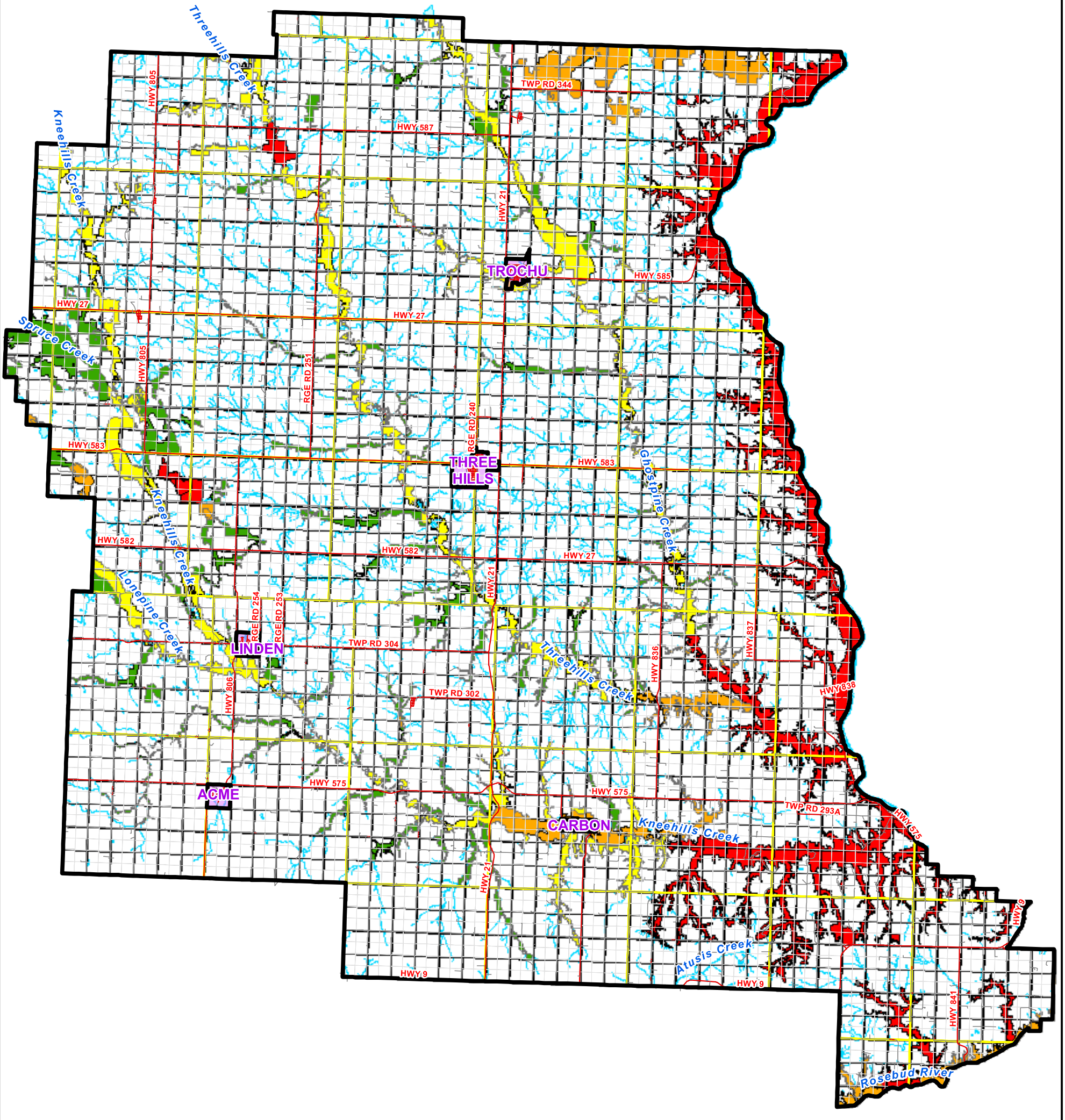
Table 6.2 Summary of original ESAs identified in Kneehill County by Cottonwood (1991).

Cottonwood ESAs	Area (hectares)	Percent of Total Kneehill County Area (%)
Bigelow Reservoir	528	0.15
Spruce Creek	3,422	1.00
Lonepine Creek	1,365	0.40
Rosebud River	4,530	1.32
Drumheller Badlands	11,983	3.50
Kneehills Creek	14,147	4.13
Threehills Ghostpine Cr.	6,600	1.93
Tolman Badlands	16,413	4.79
Trochu Meadow	986	0.29
Sunnyslope Wetlands	1,912	0.56
Total ESA Land	**61,887**	**18.07**
Non-ESA Land	**280,622**	**81.93**
Grand Total	**342,509**	**100**

Table 6.3 Summary of updated ESAs identified in Kneehill County.

Summit ESAs	ESA Areas (hectares)				Total Area (hectares)	Percent of Total Kneehill County Area (%)
	ESA-1	ESA-2	ESA-3	ESA-4		
Drumheller Badlands	881				881	0.26
Ghostpine Creek	556	120	3,265	1,347	5,288	1.54
Kneehills Creek	4,970	1,799	5,676	5,911	18,356	5.36
Rosebud River	1,065	964			2,029	0.59
Threehills Creek	1,684	723	3,354	2,486	8,247	2.41
Tolman Badlands	8,355				8,355	2.44
Perbeck ESA		2,701			2,701	0.79
Total ESA Land	**17,511**	**6,307**	**12,295**	**9,744**	**45,857**	**13.39**
Non-ESA Land					**296,652**	**86.61**
Grand Total					**342,509**	**100**
% Total of County	**5.1**	**1.8**	**3.6**	**2.8**		

Environmentally Significant Areas - Kneehill County 2009



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Kneehill County

SUMMIT ENVIRONMENTAL CONSULTANTS LTD.

Legend

Municipal Boundary

ESA Level of Significance

- 1 (Very High)
- 2 (High)
- 3 (Moderate)
- 4 (Low)

ESA Criteria*

1 Hazard lands and areas unsafe to develop (ie floodplains, steep or unstable slopes
2 Vital environmental, ecological or hydrological functions
3 Areas with rare or unique geological or physiographic features
4 Areas which contain significant, rare or endangered species
5 Unique habitats or remnants of once large habitats
6 Areas with unusually high diversity
7 Areas with large and relatively undisturbed habitats
8 Areas that provide a linking function and permit movement for wildlife
9 Areas that are excellent representatives of one or more ecosystems or landscapes that characterize a natural region
10 Areas with intrinsic appeal or widespread community interest
11 Areas with histories of scientific research
12 Areas of historical importance

*These criteria were used to help determine the Level of Significance

Sources: Kneehill County, and the Government of Alberta

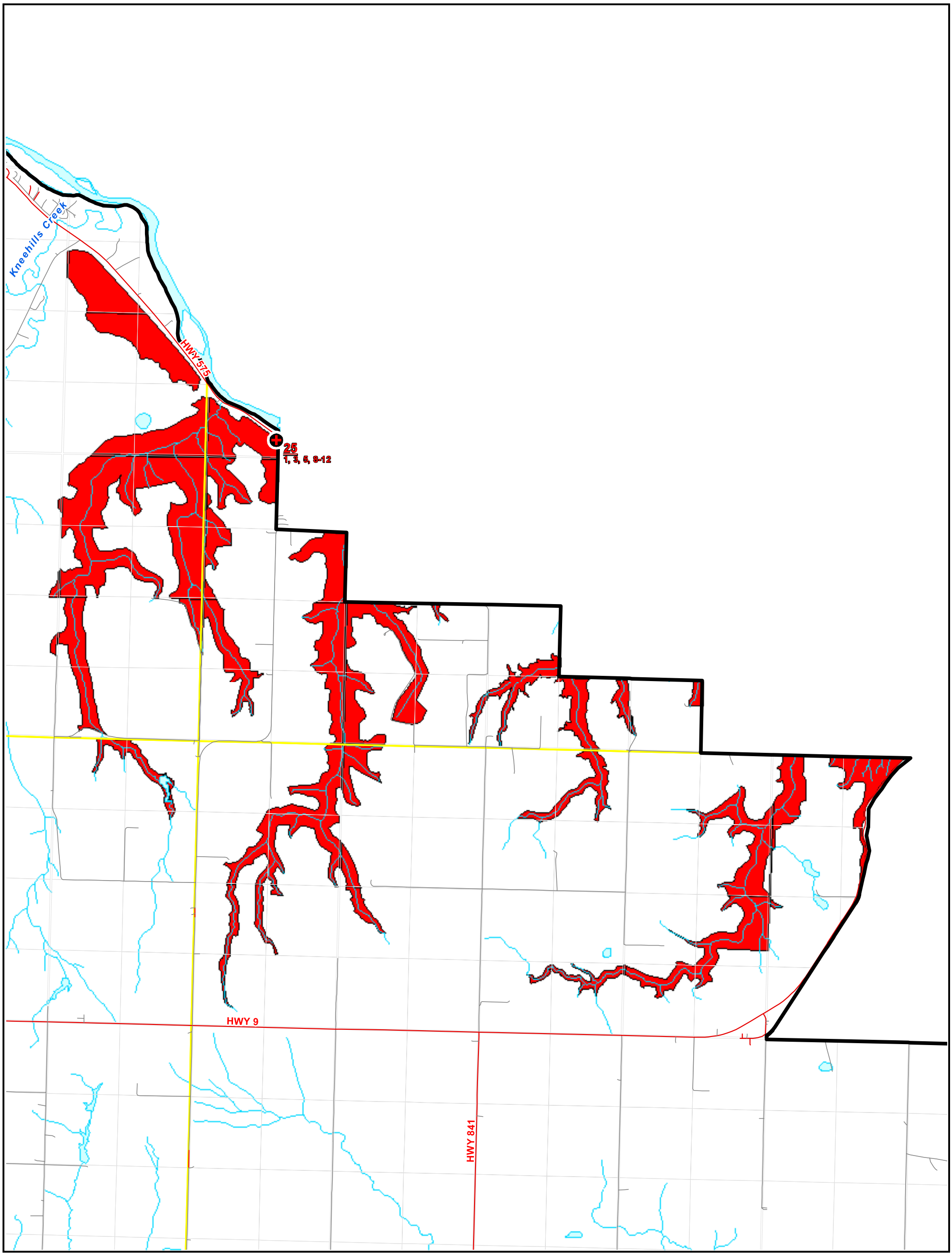
Projected in NAD 1983, UTM Zone 12

0 2 4 6 8 10
Kilometers

6.2 ESA SUMMARY MAPS AND DESCRIPTIONS

The following pages show the locations and extent of each individual ESA, their significance levels, and the applicable criteria. Additional details about each ESA, including the total area, subregions, comments on vegetation health and management considerations and site photos are also provided. The Provincial ESAs (Fiera Biological Consulting 2009) that overlap with each regional ESA are also noted. These summary sheets are designed to be used as tools for field staff, subcontractors, and the public as educational and informational tools.

Drumheller Badlands Environmentally Significant Area - Kneehill County 2009



N
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Legend

- Municipal Boundary
- Field Site Location (Site Number over ESA Criteria)

ESA Level of Significance

- 1 (Very High)
- 2 (High)
- 3 (Moderate)
- 4 (Low)

ESA Criteria*

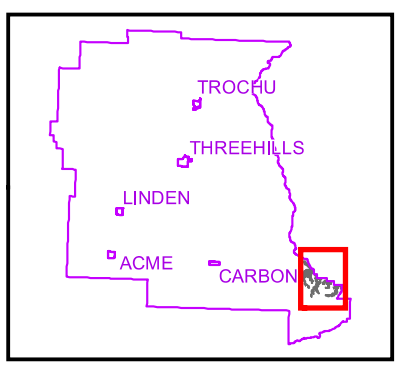
1 Hazard lands and areas unsafe to develop (ie floodplains, steep or unstable slopes
2 Vital environmental, ecological or hydrological functions
3 Areas with rare or unique geological or physiographic features
4 Areas which contain significant, rare or endangered species
5 Unique habitats or remnants of once large habitats
6 Areas with unusually high diversity
7 Areas with large and relatively undisturbed habitats
8 Areas that provide a linking function and permit movement for wildlife
9 Areas that are excellent representatives of one or more ecosystems or landscapes that characterize a natural region
10 Areas with intrinsic appeal or widespread community interest
11 Areas with histories of scientific research
12 Areas of historical importance

*These criteria were used to help determine the Level of Significance

Sources: Kneehill County, and the Government of Alberta

Projected in NAD 1983, UTM Zone 12

0 0.25 0.5 0.75 1 1.25
Kilometers



Kneehill County

SUMMIT ENVIRONMENTAL CONSULTANTS LTD.

DRUMHELLER BADLANDS ESA

Natural Subregions:
- Northern Fescue

Natural Feature Types:
- Coulees & Badlands
- Native Grassland
- Riparian Areas
- Waterbodies (Rivers, creeks and streams)

1991 Cottonwood ESAs:
- Drumheller Badlands

2009 Provincial ESAs:
- 290 – Drumheller Area Badlands (Grassland)
- 420 – Drumheller Area Badlands (Parkland)

Overall Comments:
This area covers a small portion of unique land features dominated by hoodoos and coulees located in the southeastern section of the County. The area is known for its palaeontological significance.

Surrounding Disturbance:
Due to the steep and unstable slopes, disturbance in this area is limited to flat areas outside of the coulees, and in the valley bottoms. Oil and gas, transportation (highways) and agricultural and residential activities exist throughout the area.

General Vegetation Health:
Overall vegetation health was rated as healthy due to minor disturbances from surrounding activities.

ESA Area (hectares):
- 881.5 ha

Applicable Criteria:
1. Hazard lands and areas unsafe to develop (ie. Floodplains, steep or unstable slopes)
3. Areas with rare or unique geological or physiographic features
5. Unique habitats or remnants of once large habitats
8. Areas that provide a linking function and permit movement for wildlife
9. Areas that are excellent representatives of one or more ecosystems or landscapes that characterize a natural region
10. Areas with intrinsic appeal or widespread community interest
11. Areas with histories of scientific research
12. Areas of historical importance

ESA Significance:
- ESA-1: Very High (881 ha)

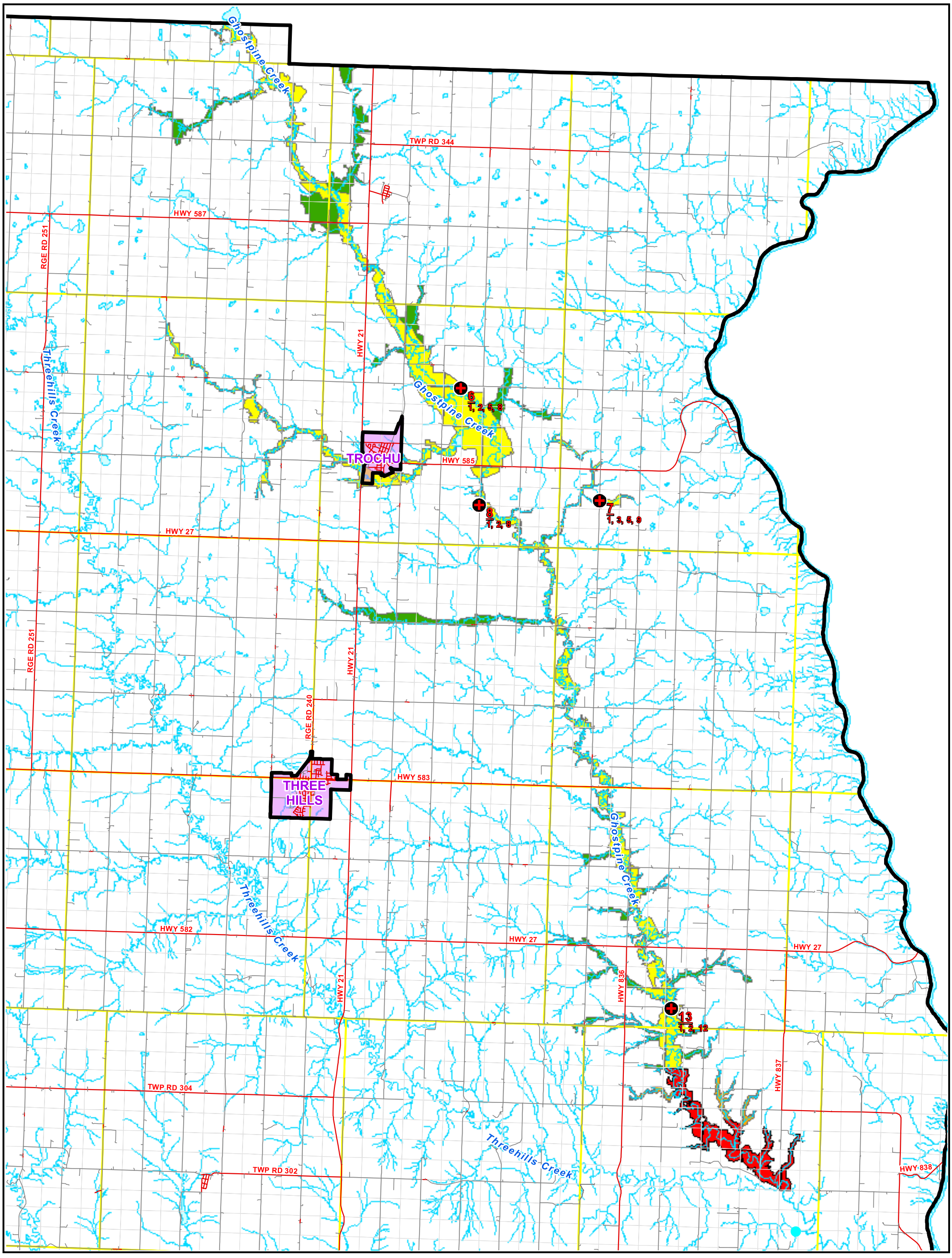
Management Considerations:
For management plans for ESA-1 through 4 refer to section 7.1. For management recommendations by natural feature type refer to section 7.2.

Photoplates:

Site: 25 **Criteria:** 1, 3, 5, 8-12
ESA Significance: ESA-1:Very high
Natural Feature Types: Coulee & Badland

Site: 25 **Criteria:** 1, 3, 5, 8-12
ESA Significance: ESA-1: Very high
Natural Feature Types: Coulee & Badland

Ghostpine Environmentally Significant Area - Kneehill County 2009



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Legend

- Municipal Boundary
- Field Site Location (Site Number over ESA Criteria)

ESA Level of Significance

- 1 (Very High)
- 2 (High)
- 3 (Moderate)
- 4 (Low)

ESA Criteria*

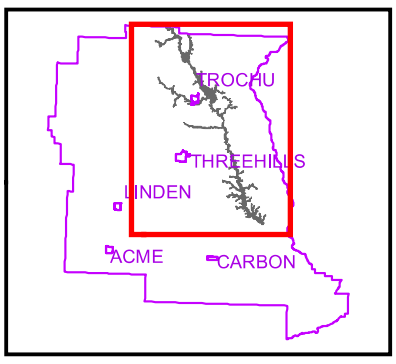
1 Hazard lands and areas unsafe to develop (ie floodplains, steep or unstable slopes
2 Vital environmental, ecological or hydrological functions
3 Areas with rare or unique geological or physiographic features
4 Areas which contain significant, rare or endangered species
5 Unique habitats or remnants of once large habitats
6 Areas with unusually high diversity
7 Areas with large and relatively undisturbed habitats
8 Areas that provide a linking function and permit movement for wildlife
9 Areas that are excellent representatives of one or more ecosystems or landscapes that characterize a natural region
10 Areas with intrinsic appeal or widespread community interest
11 Areas with histories of scientific research
12 Areas of historical importance

*These criteria were used to help determine the Level of Significance

Sources: Kneehill County, and the Government of Alberta

Projected in NAD 1983, UTM Zone 12

0 1 2 3 4 5
Kilometers



Kneehill County

SUMMIT ENVIRONMENTAL CONSULTANTS LTD.

GHOSTPINE CREEK ESA

Natural Subregions:
- Northern Fescue
- Central Parkland

Natural Feature Types:
- Aspen Forest
- Coulees
- Native Grassland
- Riparian Areas
- Waterbodies

1991 Cottonwood ESAs:
- Trochu Meadow
- Ghostpine Creek

2009 Government of Alberta ESAs:
- 117 – Grassland

Classified Wetland Types:
- IV – Semi-Permanent Ponds/Lakes
- V – Permanent Ponds/Lakes

Overall Comments:
This ESA traverses the County from the north-central border to the confluence with Three Hills Creek in the southeast. It covers a wide range of features, from wetlands and rolling topography in the north to steep valleys in the south.

Surrounding Disturbance:
Disturbance is moderate to high in the northern parts, where agriculture and developments exist and lower in the south where the land is not as suitable for development. Disturbances include poorly defined banks, erosion, exposed soils, hummocking and compaction and a high proportion of weeds and agronomic species. Contributing factors include agriculture, residences, transportation, grazing and oil and gas.

General Vegetation Health:
Overall vegetation health for the Ghostpine ESA is fair to disturbed.

ESA Area (hectares):
- 5288 ha

Applicable Criteria:
1. Hazard lands and areas unsafe to develop (ie. Floodplains, steep or unstable slopes)
2. Vital environmental, ecological or hydrological functions
3. Areas with rare or unique geological or physiographic features
5. Unique habitats or remnants of once large habitats
8. Areas that provide a linking function and permit movement for wildlife
9. Areas that are excellent representatives of one or more ecosystems or landscapes that characterize a natural region
11. Areas with histories of scientific research
12. Areas of historical importance

ESA Significance:
- ESA-1: Very High (556 ha)
- ESA-2: High (120 ha)
- ESA-3: Moderate (3265 ha)
- ESA-4: Low (1347 ha)

Management Considerations:
For management plans for ESA-1 through 4 refer to section 7.1. For management recommendations by natural feature type refer to section 7.2.

Photoplate:

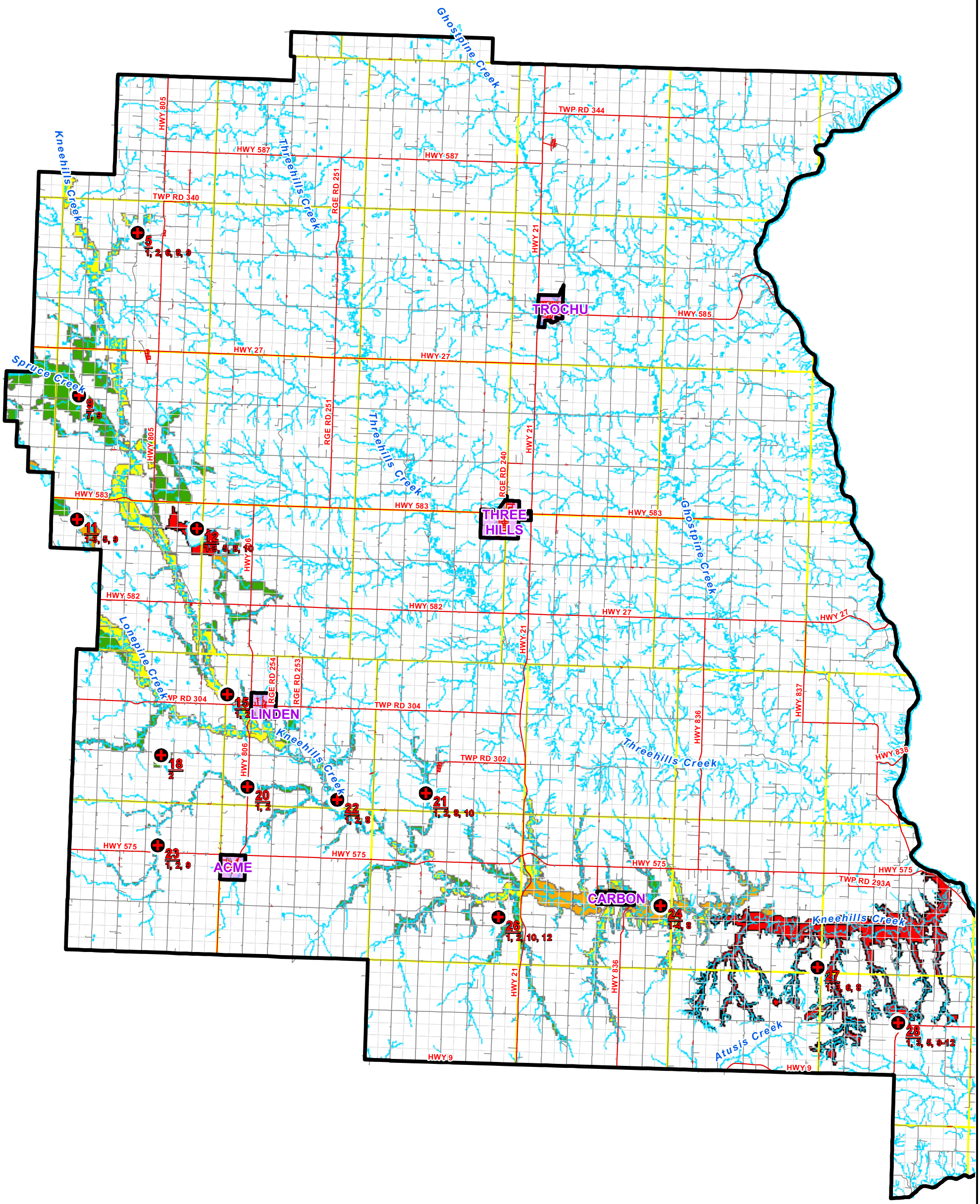
Site: 6 **Criteria:** 1, 2, 5, 8
ESA Significance: ESA-3: Moderate
Natural Feature Types: Waterbody, Native Grassland

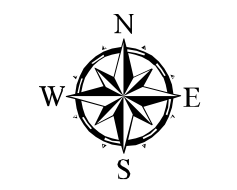
Site: 7 **Criteria:** 1, 3, 5, 9
ESA Significance: ESA-3: Moderate
Natural Feature Types: Aspen Forest, Riparian Area, Wetland, Native Grassland

Site: 8 **Criteria:** 1, 2, 8
ESA Significance: ESA-3: Moderate
Natural Feature Types: Native Grassland, Riparian Area, Waterbody

Site: 13 **Criteria:** 1, 2, 12
ESA Significance: ESA-3: Moderate
Natural Feature Types: Coulee, Riparian Area, Waterbody

Kneehills Creek Environmentally Significant Area - Kneehill County 2009





Kneehill County

SUMMIT ENVIRONMENTAL CONSULTANTS LTD.

Legend

- Municipal Boundary
- Field Site Location (Site Number over ESA Criteria) — e.g. 14 / 1, 4, 11

ESA Level of Significance

- 1 (Very High)
- 2 (High)
- 3 (Moderate)
- 4 (Low)

ESA Criteria*

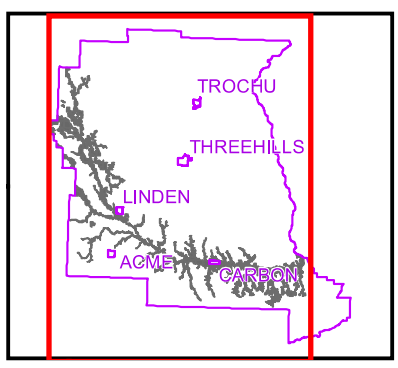
1 Hazard lands and areas unsafe to develop (ie floodplains, steep or unstable slopes
2 Vital environmental, ecological or hydrological functions
3 Areas with rare or unique geological or physiographic features
4 Areas which contain significant, rare or endangered species
5 Unique habitats or remnants of once large habitats
6 Areas with unusually high diversity
7 Areas with large and relatively undisturbed habitats
8 Areas that provide a linking function and permit movement for wildlife
9 Areas that are excellent representatives of one or more ecosystems or landscapes that characterize a natural region
10 Areas with intrinsic appeal or widespread community interest
11 Areas with histories of scientific research
12 Areas of historical importance

*These criteria were used to help determine the Level of Significance

Sources: Kneehill County, and the Government of Alberta

Projected in NAD 1983, UTM Zone 12

0 2 4 6 8
Kilometers



KNEEHILLS CREEK ESA

Natural Subregions:
- Northern Fescue
- Central Parkland
- Foothills Fescue

Natural Feature Types:
- Aspen Forest
- Coulees
- Native Grassland
- Riparian Areas
- Waterbodies

1991 Cottonwood ESAs:
- Kneehills Creek ESA
- Sunnyslope Wetlands
- Spruce Creek
- Lonepine Creek

2009 Government of Alberta ESAs:
- None listed

Classified Wetland Types:
- IV – Semi-Permanent ponds/lakes
- V – Permanent ponds/lakes
- VI – Alkali Ponds/Lakes

Overall Comments:
This ESA runs from the northwest to southeast corners. It includes an area of wetlands and ranges from rolling topography to deep valleys and badlands/coulees.

Surrounding Disturbance:
Disturbance ranges from low to high with the lowest impacts in the southeast corner and wetland section in the west. The majority of the ESA has low to moderate pressures from agriculture, transportation, grazing, oil and gas and recreation.

General Vegetation Health:
Vegetation, which ranges from stressed to very healthy, is generally more stressed in the west and southwest, except in the wetland areas where it less developed.

ESA Area (hectares):
- 18356 ha

Applicable Criteria:
1. Hazard lands and areas unsafe to develop (ie. Floodplains, steep or unstable slopes)
2. Vital environmental, ecological or hydrological functions
3. Areas with rare or unique geological or physiographic features
4. Areas that contain significant, rare or endangered species
5. Unique habitats or remnants of once large habitats
8. Areas that provide a linking function and permit movement for wildlife
9. Areas that are excellent representatives of one or more ecosystems or landscapes that characterize a natural region
10. Areas with intrinsic appeal or widespread community interest
11. Areas with histories of scientific research
12. Areas of historical importance

ESA Significance:
- ESA-1: Very High (4970 ha)
- ESA-2: High (1799 ha)
- ESA-3: Moderate (5676 ha)
- ESA-4: Low (5911 ha)

Management Considerations:
For management plans for ESA-1 through 4 refer to section 7.1. For management recommendations by natural feature type refer to section 7.2.

Photoplate:

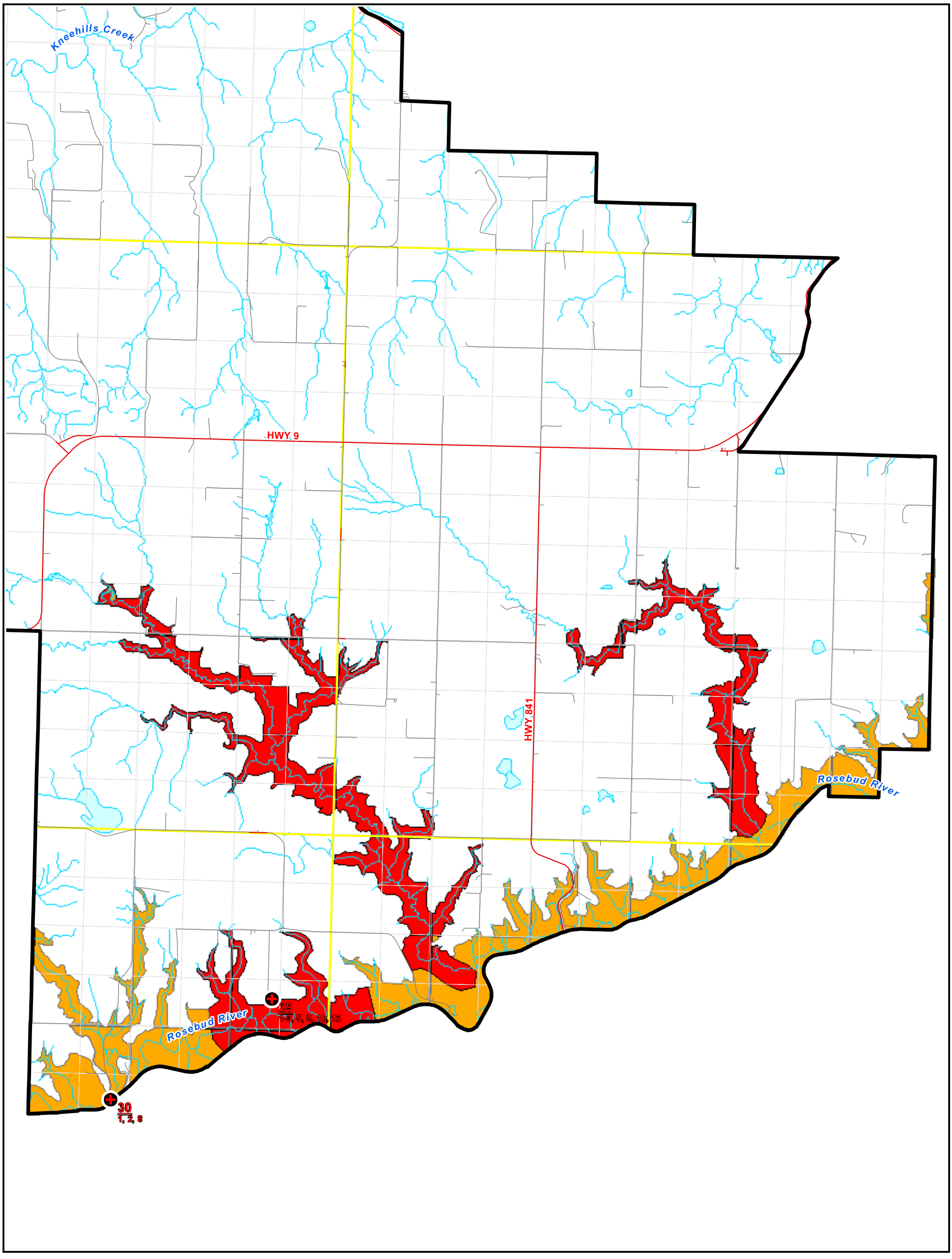
Site: 11 **Criteria:** 1-3, 5, 9
ESA Significance: ESA-2: High
Natural Feature Types: Aspen Forest, Riparian Area, Wetland

Site: 20 **Criteria:** 1, 2
ESA Significance: ESA-4: Low
Natural Feature Types: Aspen Forest, Riparian Area, Waterbody

Site: 24 **Criteria:** 1-4, 8
ESA Significance: ESA-2: High
Natural Feature Types: Riparian Area, Waterbody

Site: 28 **Criteria:** 1, 3, 5, 9-12
ESA Significance: ESA-1: Very high
Natural Feature Types: Coulee & Badlands, Native Grassland

Rosebud River Environmentally Significant Area - Kneehill County 2009



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Legend

- Municipal Boundary
- Field Site Location (Site Number over ESA Criteria)

ESA Level of Significance

- 1 (Very High)
- 2 (High)
- 3 (Moderate)
- 4 (Low)

ESA Criteria*

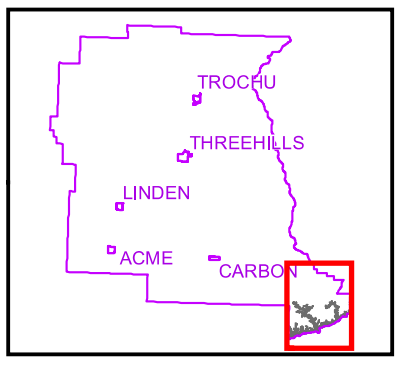
1 Hazard lands and areas unsafe to develop (ie floodplains, steep or unstable slopes
2 Vital environmental, ecological or hydrological functions
3 Areas with rare or unique geological or physiographic features
4 Areas which contain significant, rare or endangered species
5 Unique habitats or remnants of once large habitats
6 Areas with unusually high diversity
7 Areas with large and relatively undisturbed habitats
8 Areas that provide a linking function and permit movement for wildlife
9 Areas that are excellent representatives of one or more ecosystems or landscapes that characterize a natural region
10 Areas with intrinsic appeal or widespread community interest
11 Areas with histories of scientific research
12 Areas of historical importance

*These criteria were used to help determine the Level of Significance

Sources: Kneehill County, and the Government of Alberta

Projected in NAD 1983, UTM Zone 12

0 0.5 1 1.5 2
Kilometers



Kneehill County

SUMMIT ENVIRONMENTAL CONSULTANTS LTD.

ROSEBUD RIVER ESA

Natural Subregions:
- Northern Fescue
- Foothills Fescue

Natural Feature Types:
- Aspen Forest
- Coulees & Badlands
- Native Grassland
- Riparian Areas
- Waterbodies

1991 Cottonwood ESAs:
- Rosebud River

2009 Provincial ESAs:
- 290 – (Grassland)

Overall Comments:
The Rosebud River runs through the County's southeast corner, just before it enters into the Red Deer River. This portion of the river has steeped-walled valleys, which creates unique landscape features and highly significant wildlife habitats.

Surrounding Disturbance:
Overall, this area is only moderately disturbed. High disturbance sites occur where there is transportation, oil and gas, agriculture and/or grazing. Minimally disturbed sites generally occur in the more deeply incised hazard lands and the Beynon Coulee, a protected area.

General Vegetation Health:
Vegetation health ranges from stressed to very healthy, depending the land uses which largely determine soil exposure, stability and presence of agronomic and weed species.

ESA Area (hectares):
- 2029 ha

Applicable Criteria:
1. Hazard lands and areas unsafe to develop (ie. Floodplains, steep or unstable slopes)
2. Vital environmental, ecological or hydrological functions
3. Areas with rare or unique geological or physiographic features
5. Unique habitats or remnants of once large habitats
8. Areas that provide a linking function and permit movement for wildlife
10. Areas with intrinsic appeal or widespread community interest
12. Areas of historical importance

ESA Significance:
- ESA-1: Very high (1065 ha)
- ESA-2: High (964 ha)

Management Considerations:
For management plans for ESA-1 through 4 refer to section 7.1. For management recommendations by natural feature type refer to section 7.2.

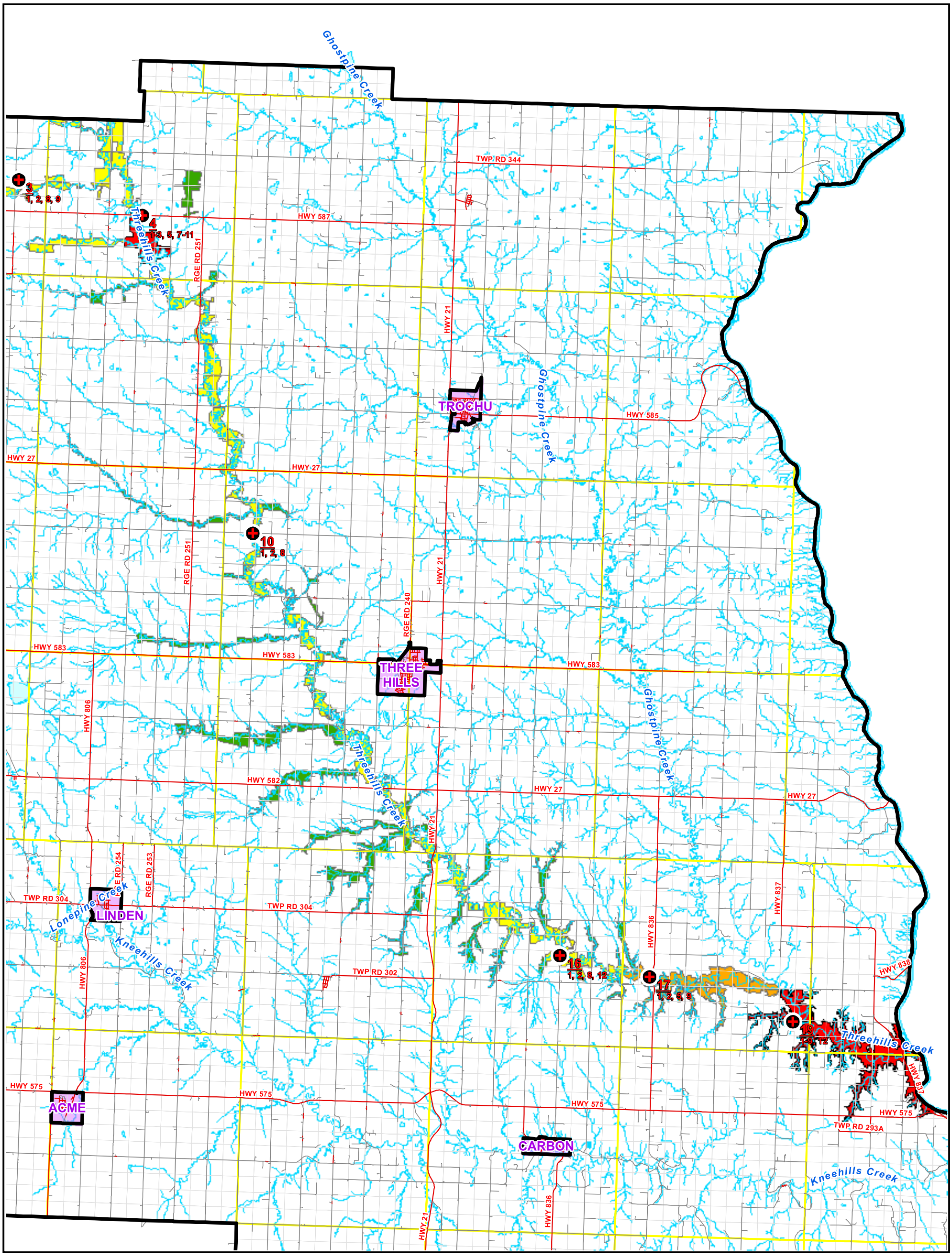
Photoplate:

Site: 29 **Criteria:** 1-3, 5, 8, 10, 12
ESA Significance: ESA-1:Very High
Natural Feature Types: Coulee & Badlands, Native Grasslands

Site: 29 **Criteria:** 1, 2, 8
ESA Significance: ESA-2: High
Natural Feature Types: Aspen Forest

Site: 30 **Criteria:** 1, 2, 8
ESA Significance: ESA-2: High
Natural Feature Types: Riparian Area, Waterbody

Threehills Creek Environmentally Significant Area - Kneehill County 2009



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Legend

- Municipal Boundary
- Field Site Location (Site Number over ESA Criteria)

ESA Level of Significance

- 1 (Very High)
- 2 (High)
- 3 (Moderate)
- 4 (Low)

ESA Criteria*

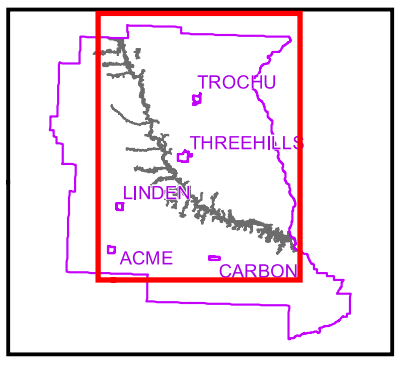
1 Hazard lands and areas unsafe to develop (ie floodplains, steep or unstable slopes
2 Vital environmental, ecological or hydrological functions
3 Areas with rare or unique geological or physiographic features
4 Areas which contain significant, rare or endangered species
5 Unique habitats or remnants of once large habitats
6 Areas with unusually high diversity
7 Areas with large and relatively undisturbed habitats
8 Areas that provide a linking function and permit movement for wildlife
9 Areas that are excellent representatives of one or more ecosystems or landscapes that characterize a natural region
10 Areas with intrinsic appeal or widespread community interest
11 Areas with histories of scientific research
12 Areas of historical importance

*These criteria were used to help determine the Level of Significance

Sources: Kneehill County, and the Government of Alberta

Projected in NAD 1983, UTM Zone 12

0 2 4 6
Kilometers



Kneehill County

SUMMIT ENVIRONMENTAL CONSULTANTS LTD.

THREEHILLS CREEK ESA

Natural Subregions:
- Northern Fescue
- Central Parkland

Natural Feature Types:
- Aspen Forest
- Coulee & Badlands
- Native Grassland
- Riparian Area
- Waterbody (Wetland)

1991 Cottonwood ESAs:
- Three Hills Creek
- Bigelow Reservoir

2009 Government of Alberta ESAs:
- None listed

Classified Wetland Types:
- IV – Semi-Permanent Ponds/Lakes
- V – Permanent Ponds/Lakes

Overall Comments:
Three Hills Creek covers all types of terrain and natural features found in Kneehill County. The disturbance levels and levels of ESA significance reflect these differences.

Surrounding Disturbance:
Because of the large area it covers, Three Hills ESA has varying levels of disturbance from agriculture and grazing, transportation and residences and oil and gas.

General Vegetation Health:
Vegetation health ranged from stressed to very healthy, generally moving from the north to the south of the County. Abundance of agronomic species and grazing impacts were the main pressures affecting vegetation health.

ESA Area (hectares):
- 8247 ha

Applicable Criteria:
1. Hazard lands and areas unsafe to develop (ie. Floodplains, steep or unstable slopes)
2. Vital environmental, ecological or hydrological functions
3. Areas with rare or unique geological or physiographic features
4. Areas that contain significant, rare or endangered species
5. Unique habitats or remnants of once large habitats
6. Areas with unusually high diversity
7. Areas with large and relatively undisturbed habitats
8. Areas that provide a linking function and permit movement for wildlife
9. Areas that are excellent representatives of one or more ecosystems or landscapes that characterize a natural region
10. Areas with intrinsic appeal or widespread community interest
11. Areas with histories of scientific research
12. Areas of historical importance

ESA Significance:
- ESA-1: Very High (1684 ha)
- ESA-2: High (723 ha)
- ESA-3: Moderate (3354 ha)
- ESA-4: Low (2486 ha)

Management Considerations:
For management plans for ESA-1 through 4 refer to section 7.1. For management recommendations by natural feature type refer to section 7.2

Photoplate:

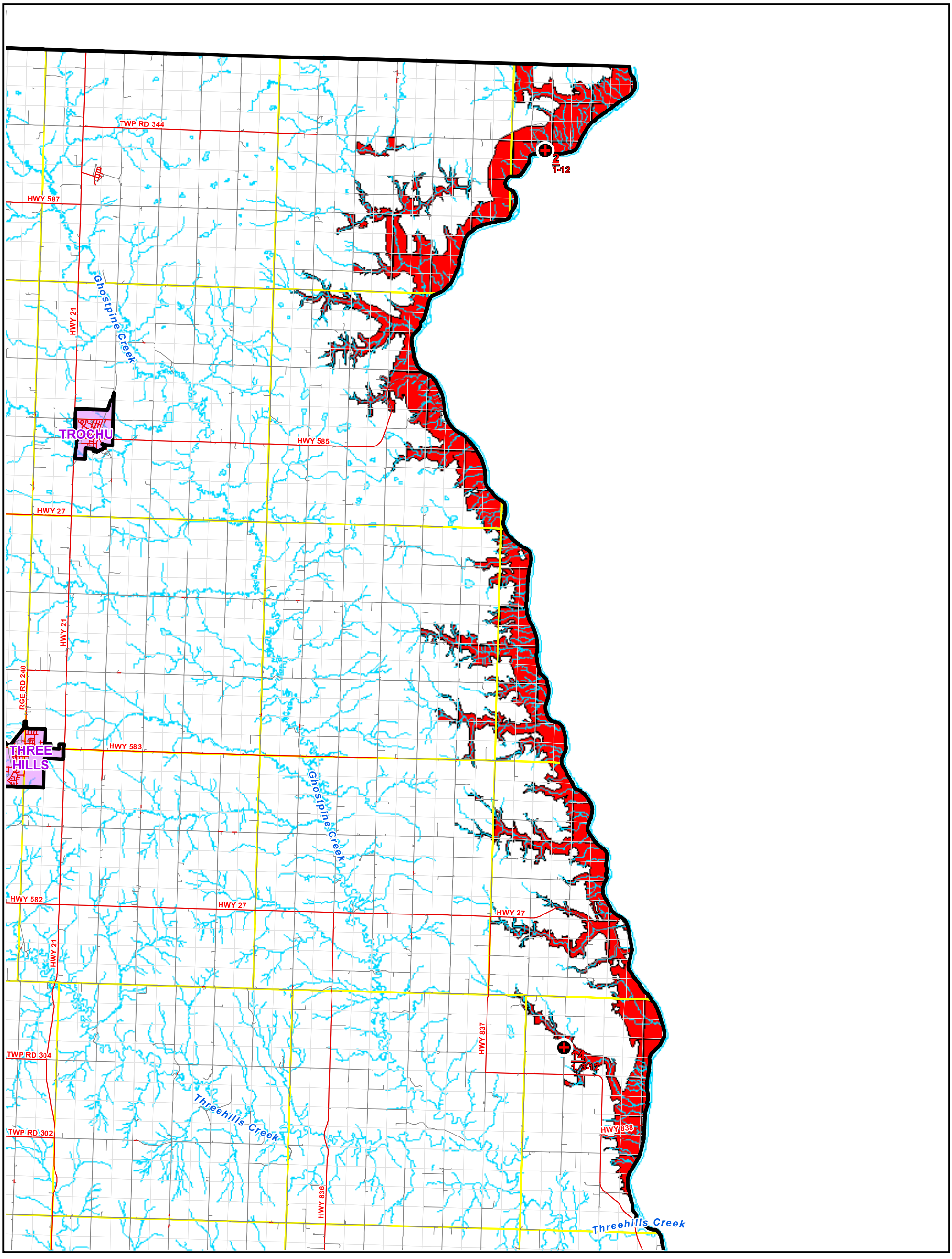
Site: 19 **Criteria:** 1-9, 12
ESA Significance: ESA-1:Very high
Natural Feature Types: Aspen Forest, Coulee & Badland, Native Grassland

Site: 17 **Criteria:** 1, 2, 5, 9
ESA Significance: ESA-2: High
Natural Feature Types: Coulee & Badlands, Riparian Areas, Waterbody

Site: 16 **Criteria:** 1, 2, 8
ESA Significance: ESA-3: Moderate
Natural Feature Types: Riparian Areas, Waterbody

Site: 4 **Criteria:** 1, 2, 3, 5, 7 - 11
ESA Significance: ESA-1:Very high
Natural Feature Types: Wetland, Riparian Areas

Tolman Badlands Environmentally Significant Area - Kneehill County 2009



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Kneehill County

SUMMIT ENVIRONMENTAL CONSULTANTS LTD.

Legend

- Municipal Boundary
- Field Site Location (Site Number over ESA Criteria)

ESA Level of Significance

- 1 (Very High)
- 2 (High)
- 3 (Moderate)
- 4 (Low)

ESA Criteria*

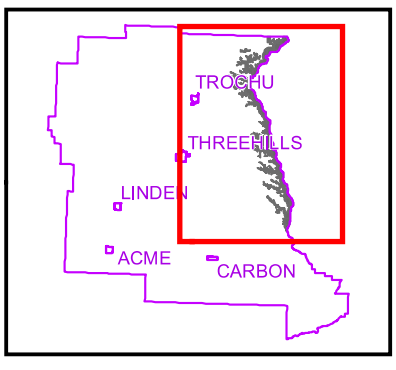
1 Hazard lands and areas unsafe to develop (ie floodplains, steep or unstable slopes
2 Vital environmental, ecological or hydrological functions
3 Areas with rare or unique geological or physiographic features
4 Areas which contain significant, rare or endangered species
5 Unique habitats or remnants of once large habitats
6 Areas with unusually high diversity
7 Areas with large and relatively undisturbed habitats
8 Areas that provide a linking function and permit movement for wildlife
9 Areas that are excellent representatives of one or more ecosystems or landscapes that characterize a natural region
10 Areas with intrinsic appeal or widespread community interest
11 Areas with histories of scientific research
12 Areas of historical importance

*These criteria were used to help determine the Level of Significance

Sources: Kneehill County, and the Government of Alberta

Projected in NAD 1983, UTM Zone 12

0 1 2 3 4 5
Kilometers



TOLMAN BADLANDS ESA

Natural Subregions:
- Northern Fescue
- Central Parkland

Natural Feature Types:
- Aspen Forest
- Coulees & Badlands
- Native Grassland
- Riparian Areas
- Waterbodies

1991 Cottonwood ESAs:
- Tolman Badlands

2009 Government of Alberta ESAs:
- 290 – Tolman Badlands Heritage Rangeland Natural Area (Grassland)
- 416 – Dry Island Buffalo Jump Provincial Park and
  Tolman Badlands Heritage Rangeland Natural Area (Parkland)
- 420 – Tolman Badlands Heritage Rangeland Natural Area (Parkland)
- 421 – Dry Island Buffalo Jump Provincial Park (Parkland)

Overall Comments:
This ESA runs along the eastern border of Kneehill County, and is distinguished by the coulee and badland features which have warranted its inclusion with the Provincial ESAs as having National significance.

Surrounding Disturbance:
Disturbances throughout the Tolman Badlands ESA are limited because of the hazard lands that characterize the area. There are limited roads to access the area, and small agricultural areas used for grazing and cultivation.

General Vegetation Health:
The vegetation health is very healthy because of the low levels of disturbance.

ESA Area (hectares):
- 8355 ha

Applicable Criteria:
1. Hazard lands and areas unsafe to develop (ie. Floodplains, steep or unstable slopes)
2. Vital environmental, ecological or hydrological functions
3. Areas with rare or unique geological or physiographic features
4. Areas which contain significant, rare or endangered species
5. Unique habitats or remnants of once large habitats
6. Areas with unusually high diversity
7. Areas with large and relatively undisturbed habitats
8. Areas that provide a linking function and permit movement for wildlife
9. Areas that are excellent representatives of one or more ecosystems or landscapes that characterize a natural region
10. Areas with intrinsic appeal or widespread community interest
11. Areas with histories of scientific research
12. Areas of historical importance

ESA Significance:
- ESA-1: Very High (8355 ha)

Management Considerations:
For management plans for ESA-1 through 4 refer to section 7.1. For management recommendations by natural feature type refer to section 7.2.

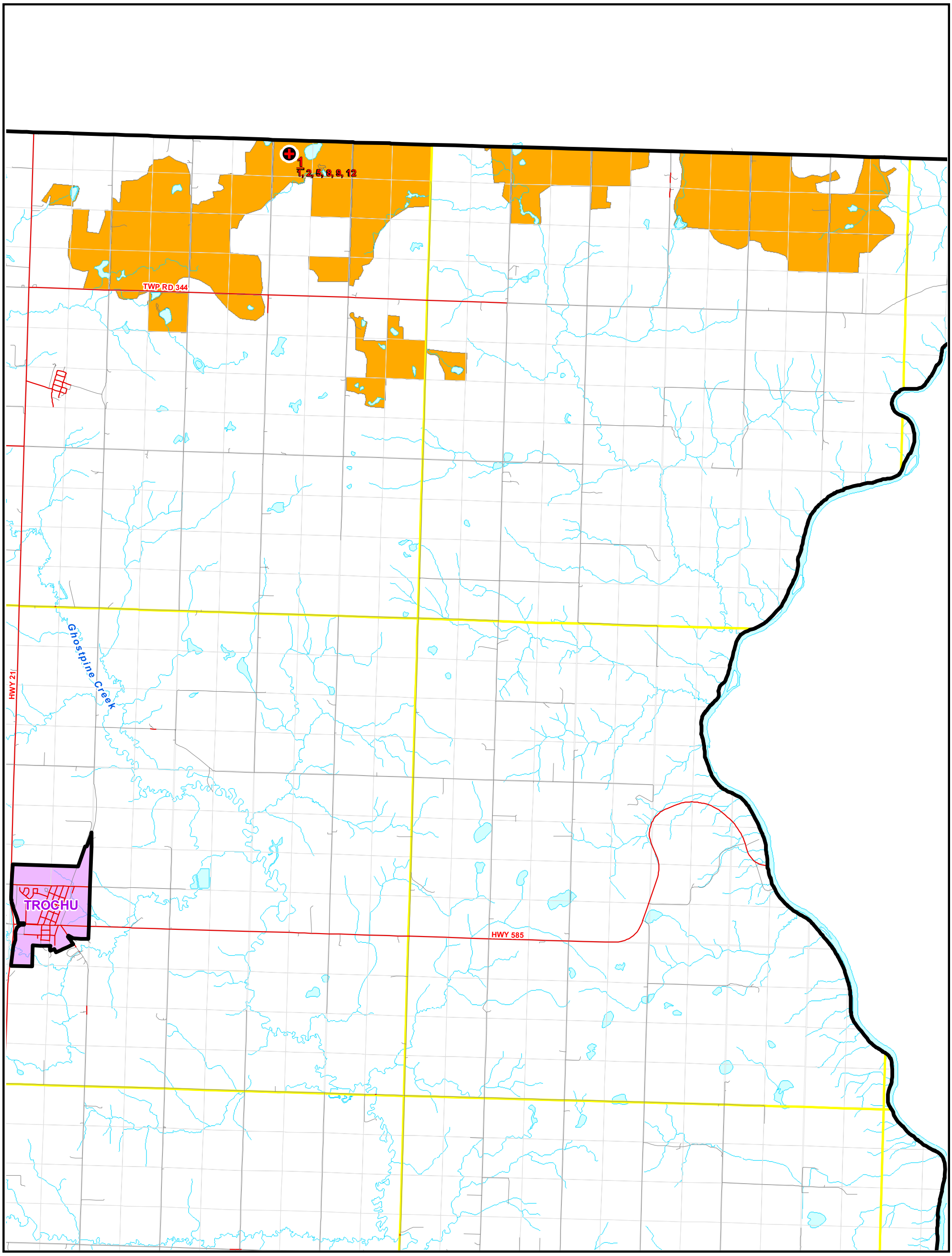
Photoplate:

Site: 2 **Criteria:** 1-12
ESA Significance: Very high
Natural Feature Types: Riparian Area, Waterbody

Site: 2 **Criteria:** 1-12
ESA Significance: Very high
Natural Feature Types: Badlands, Native Grassland

Site: 14 **Criteria**: 1, 3-12
ESA Significance: Very high
Natural Feature Types: Aspen Forest, Coulee & Badland, Native Grassland

Perbeck Environmentally Significant Area - Kneehill County 2009



Legend

- Municipal Boundary
- Field Site Location (Site Number over ESA Criteria)

ESA Level of Significance

- 1 (Very High)
- 2 (High)
- 3 (Moderate)
- 4 (Low)

ESA Criteria*

1. Hazard lands and areas unsafe to develop (ie floodplains, steep or unstable slopes
2. Vital environmental, ecological or hydrological functions
3. Areas with rare or unique geological or physiographic features
4. Areas which contain significant, rare or endangered species
5. Unique habitats or remnants of once large habitats
6. Areas with unusually high diversity
7. Areas with large and relatively undisturbed habitats
8. Areas that provide a linking function and permit movement for wildlife
9. Areas that are excellent representatives of one or more ecosystems or landscapes that characterize a natural region
10. Areas with intrinsic appeal or widespread community interest
11. Areas with histories of scientific research
12. Areas of historical importance

*These criteria were used to help determine the Level of Significance

Sources: Kneehill County, and the Government of Alberta

Projected in NAD 1983, UTM Zone 12

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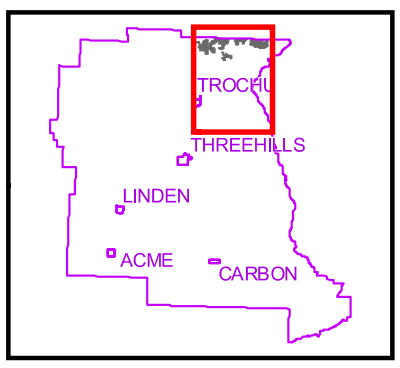
Kilometers



Kneehill County

SUMMIT ENVIRONMENTAL CONSULTANTS LTD.

PERBECK ESA

Natural Subregions:
- Central Parkland

Natural Feature Types:
- Aspen Forest
- Riparian Areas
- Waterbodies (Wetlands)

1991 Cottonwood ESAs:
- N/A

2009 Government of Alberta ESAs:
- 117 – Grassland

Classified Wetland Types:
- IV – Semi-Permanent Ponds/Lakes
- V – Permanent Ponds/Lakes
- VII – Fen Ponds

Overall Comments:
This ESA is characterized by the unique habitat that it provides within the County. Aspen forest with pockets of wetlands creates opportunities for wildlife foraging, nesting, and rearing that do not exist at the same scale in the rest of the County.

Surrounding Disturbance:
Located in the northeast corner of the County, this area is lightly interspersed with road infrastructure, agricultural operations, and residences.

General Vegetation Health:
The area is characterized by healthy vegetation, with weed species that appear to originate from disturbances in the area (seeded road developments, agricultural operations, etc.)

ESA Area (hectares):
- 2701.18 ha

Applicable Criteria:
1. Hazard lands and areas unsafe to develop (ie. Floodplains, steep or unstable slopes)
2. Vital environmental, ecological or hydrological functions
5. Unique habitats or remnants of once large habitats
8. Areas that provide a linking function and permit movement for wildlife
9. Areas that are excellent representatives of one or more ecosystems or landscapes that characterize a natural region

ESA Significance:
- ESA-2: High (2701 ha)

Management Considerations:
For management plans for ESA-1 through 4 refer to section 7.1. For management recommendations by natural feature type refer to section 7.2

Photoplate:

Site: 1 **Criteria:** 1, 2, 5, 8, 9
ESA Significance: ESA-2: High
Natural Feature Types: Aspen Forest, Riparian Area, Waterbody

Site: 1 **Criteria:** 1, 2, 5, 8, 9
ESA Significance: ESA-2: High
Natural Feature Types: Aspen Forest, Riparian Area, Waterbody (Wetland)

6.3 REVIEW OF PROVINCIAL ESAS

Provincial Environmentally Significant Areas were updated in 2009 (Fiera Biological Consulting 2009). While the original 1997/98 review included a compilation of ESA reports and documents from smaller municipalities and counties within the province, the 2009 update did not use these individual reports (Sweetgrass Consulting 1997). The 2009 approach took advantage of advances in GIS technology and planning tools, allowing for the results to be more rigorous, objective, and repeatable (Fiera Biological Consulting 2009). It was hoped that this updated review of ESAs would identify areas for special consideration during the regional land-use planning as part of the Alberta Land Use Framework as enacted by Bill 36, the *Land Stewardship Act (*Government of Alberta 2009a). Provincial and municipal ESAs provide valuable tools to support the principle of knowledge-based decision-making to support land-use planning and environmental stewardship (Government of Alberta 2009a).

A set of seven criteria were used by Fiera Biological Consulting (2009) to define the ESAs for the Provincial Review:

1. Areas that contain elements of conservation concern (ANHIC, SARA, COSEWIC, Alberta *Wildlife Act*, General Status of Alberta Wild Species 2005)
2. Areas that contain rare or unique landforms
    - Plains, plateaus, mountains, sand dunes, eskers, glacial moraines, rare wetlands (fens, channel fens, marl ponds)
    - Less than 5 occurrences in the province
3. Areas that contain habitat for focal species
    - Grizzly bear, ferruginous hawk, western burrowing owl, woodland caribou
4. Areas that contain important wildlife habitat
    - Bird rookeries, wintering concentration areas, migratory staging areas, hibernacula
5. Riparian Areas
    - 1st and 2nd order streams in Rocky Mountains and Foothills Natural Regions

- Intact riparian areas along the eleven major river basins
- Riparian areas along six major rivers (Athabasca River, Milk River, Peace River, Red Deer River, North Saskatchewan River, South Saskatchewan River)

6. Large Natural Areas
7. Sites of recognized significance
    - By various organizations including UNESCO World Heritage Sites, RAMSAR Convention on wetlands, Important Bird Areas (IBAs), Canadian Heritage Rivers System, and National and Provincial protected areas greater than 1,000 hectares in size.

The methods used to create the ESAs required obtaining GIS data for each of these criteria. ESAs were then evaluated within each quarter section (approximately 64 ha in size) in accordance with the Alberta Township System. ESAs were defined and ranked according to the GIS data, and weighted based on the seven criteria. Significance ratings of the ESAs were broken into International, National, or Provincial Significance based on criteria listed in Table 6.4.

Table 6.4 Criteria used to determine level of significance for Provincial Environmentally Significant Areas.

Level of Significance		
International	**National**	**Provincial**
Element occurrences listed as globally rare (G1/G2)	Species At Risk – Endangered or Threatened	All defined ESAs that did not fall into the International or National Significance rating
Internationally recognized landforms	Nationally recognized landforms	
RAMSAR Wetlands	Nationally significant Important Bird Areas	
Continentally or globally significant Important Bird Areas	National Parks	
UNESCO World Heritage Sites	Canadian Heritage Rivers System	

SOURCE: Fiera Biological Consulting 2009

Results of the Provincial ESA analysis showed that there are 754 ESAs in the province of Alberta. The provincial ESA review shows that Provincially-ranked ESAs are concentrated in the northern half of the province, while Nationally-ranked ESAs are more dominant along the waterbodies and areas in the central and southern portions of the province. Internationally-ranked ESAs in Alberta are primarily found in Wood Buffalo National Park, and in the Foothills of the Rocky Mountains.

Of the 754 Provincial ESAs, those occurring in the same natural subregions as Kneehill County include: 107 ESAs in the Central Parkland Subregion; 27 ESAs in the Northern Fescue Subregion; and 56 sites in the Foothills Fescue Subregion (Fiera Biological Consulting 2009). Within Kneehill County, there are five ESAs (16,169.5 hectares or 4.7% of the County), and all have a National ranking (Table 6.5, Figure 6.3). Over half of the total area of Provincial ESAs within Kneehill County is captured by the current County-wide ESA assessment (Table 6.6). The main reason for the discrepancy is due to the different scale at which the two reviews were conducted.

Additional information about natural features, wildlife and land use in Provincial ESAs in Kneehill County can be obtained from the provincial report (Fiera Biological Consulting 2009). Appendix 2 of that document lists various GIS layers covering Alberta, which can be used to locate specific features of interest within the County. For instance, there are layers of badland topography in south-eastern Alberta, native vegetation and native prairie vegetation inventories for the Central Parkland, and habitat suitability indices for Species at Risk, including the western burrowing owl.

Table 6.5 2009 Provincial Review ESAs: ESAs of National significance occurring in Kneehill County.

ESA ID Number		Criteria						
	Natural Subregion(s)	1 – # of Element Occurrences	2 – Rare or unique landforms	3 – Habitat for focal species	4 – Important wildlife habitat	5 – Riparian Areas	6 – Large natural areas	7 – Recognized significance
117	Dry Mixedgrass Northern Fescue Central Parkland Mixedgrass Dry Mixedwood Foothills Fescue Montane			Ferruginous hawk, Western burrowing Owl			X	
290	Northern Fescue Mixedgrass	12	Drumheller Area badlands	Ferruginous Hawk, Western burrowing owl		Intact riparian areas, riparian areas along the six major rivers	X	Tolman Badlands Heritage Rangeland Natural Area
416	Central Parkland Northern Fescue	15		Ferruginous Hawk, Western burrowing owl	X	Intact riparian areas, riparian areas along the six major rivers	X	Dry Island Buffalo Jump Provincial Park, Tolman Badlands Heritage Rangeland Natural Area
420	Central Parkland Northern Fescue	7	Drumheller Area badlands	Ferruginous Hawk, Western burrowing owl		Intact riparian areas, riparian areas along the six major rivers	X	Tolman Badlands Heritage Rangeland Natural Area
421	Central Parkland	10		Ferruginous Hawk		Intact riparian areas, riparian areas along the six major rivers	X	Dry Island Buffalo Jump Provincial Park

X – Indicates that the criteria applied to that ESA ID Number
Source: Fiera Biological Consulting 2009

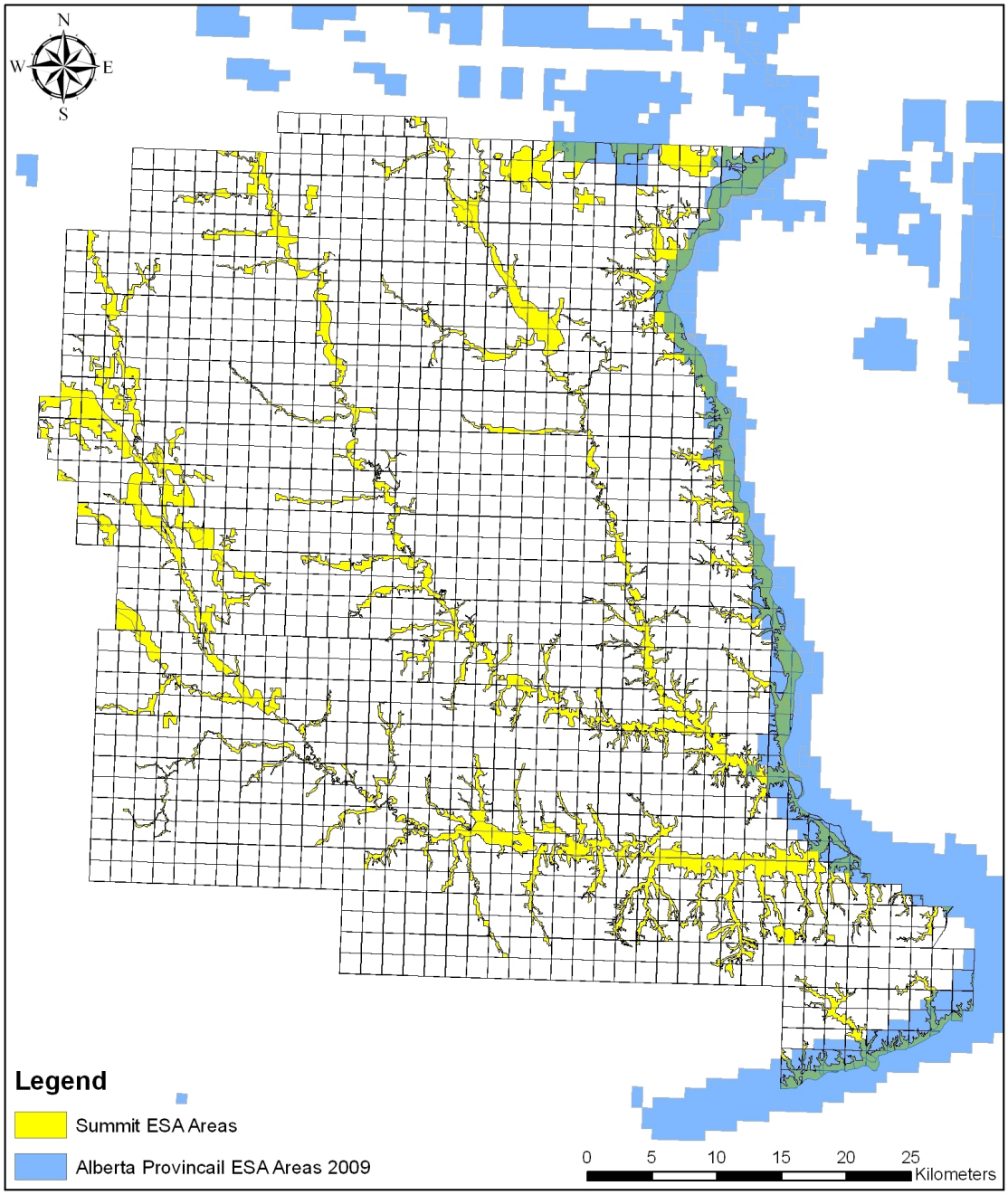


Figure 6.10 ESAs identified in Alberta compared to ESAs identified for Kneehill County.

Table 6.6 Comparison of Provincial and County ESAs within Kneehill County.

Kneehill County ESA Name	Provincial ESA[1] Site Number and Area (ha)					
	117	**290**	**416**	**420**	**421**	**Total Area (ha)**
Drumheller Badlands		330.9				**330.9**
Kneehills Creek		255.3				**255.3**
Rosebud River		1419.5				**1419.5**
Threehills Creek		430.9		44.1		**475**
Tolman Badlands		1040	1601.7	1963.1	936.8	**5541.6**
Perbeck	709.7		29.3			**739**
Remaining Area in Kneehill County	817.1	5426.3	692.5	210.5	261.8	**7408.2**
Total Area of Kneehill County	1526.8	8902.9	2323.5	2217.7	1198.6	**16169.5**

SOURCE: [1]Fiera Biological Consulting 2009

6.4 CUMULATIVE EFFECTS OF THE LOSS OF ESAS

Cumulative effects can be defined as "the changes to the environment caused by an activity in combination with other past, present, and reasonably foreseeable human activities" (Alberta Environment et al. 2000). When looking at the loss of environmentally significant areas, the cumulative effects stem from development activities which change land-uses, disrupt land capabilities, or cause effects on portions of the ecosystem which change its function. ESAs have been designated and ranked according to their importance in an ecosystem for one of many reasons (section 2.3); therefore, the cumulative loss of ESAs will have impacts on the functioning and level of significance of ESAs as they are ranked within Kneehill County.

Human activities have a cumulative effect on ESAs, resulting in the downgrading of ESA significance rankings (i.e. ESA-1 to an ESA-3). Specifically, reduced habitat availability, loss of special features and sensitive habitats, and the blockage of wildlife movement corridors may isolate populations and inhibit reproduction, thereby reducing overall biodiversity. The cumulative fragmentation and disturbance of intact habitat will result in decreased significance and perhaps the loss of ESA area. For example, many of Alberta's

natural grasslands have been converted to surface mining, forestry, agriculture, grazing, and industrial and urban developments, and are no longer candidate ESAs.

One way to manage and prevent the loss of ESA areas is to overlay ESA maps onto current aerial photos. This would provide a clear picture of those areas which are changing. ESA rank and criteria could then be contrasted to current land use conditions, and dependant upon the level of change (in significance), management strategies may then need to be reviewed to evaluate their effectiveness. The integration of ESA mapping with other databases including oil and gas development, agricultural land use, riparian fencing programs, and weed inventories would also aid in completing a cumulative effects assessment that could be integrated into future ESA mapping. By taking a look at the bigger picture of development on the landscape at the County level, changes in significance and overall area will be easier to monitor.

6.5 SIGNIFICANT CULTURAL AND HISTORICAL RESOURCES

According to Arrow Archaeology (Temoin 2008), a total of 346 historical resource sites have been recorded within Kneehill County (Appendix D). However, many have been disturbed or destroyed by agriculture and other development activities. Most of these sites were small archaeological sites of limited scientific significance. Due to the County's long history of agriculture and other development, as well as the general geological, geomorphological and topographical situation, the potential for the discovery of as yet unrecorded historical resources is limited primarily to the eastern and south-eastern portions of the County; which has some potential to contain unrecorded historical resources.

We believe that areas of highest historical significance were captured by the ESAs, primarily because both ESAs and HRVs tend to be located adjacent to (and within) river valleys, creek valleys and coulees.

7.0 MANAGEMENT CONSIDERATIONS

One of the objectives of the Kneehill County Municipal Development Plan (MDP) is to accommodate non-agricultural land uses while recognizing the need to protect agricultural uses (Kneehill County 2005). Non-agricultural areas of the County contain a range of natural features characteristic of the Central Parkland, Foothills Fescue and Northern Fescue Subregions. Land management approaches should consider unique functions and sensitivities of these features to disturbance.

Kneehill County is ecologically diverse, and most ESAs cross through a range of natural feature types. Therefore, management objectives were developed for each ESA significance rank. Also, we developed specific management practices for each major natural feature type (i.e. water bodies, grasslands, aspen forest, coulees and badlands, etc.). The application of the listed actions and the amount of effort put into each depends on the ESA levels of significance (Section 2.3) and applicable guidelines and regulations (Section 5.0), the type of land use and land ownership within or near the ESA, and the specific goals of the management practices.

Land managers can draw from these management recommendations for guidance, but specific management decisions and actions should be based on site-specific information, legislation and, where appropriate, additional site assessment. The following sections outline the management objectives for ESAs-1 to -4 and non-ESAs (Section7.1) and recommended management practices for each natural feature type (Section 7.2). Management guidelines for areas with major physical constraints and areas containing cultural and historical resources are provided in Sections 7.4 and 7.5, respectively.

7.1 MANAGEMENT OBJECTIVES FOR ESAS

In order to meet the environmental objectives of Kneehill County and work towards the Government of Alberta's recently adopted Land-Use Framework, planners should set the management goals to preserve the most significant ESAs (ESA-1 and -2) and limit

disturbance to or improve less significant ones (ESA-3 and -4). Management objectives for each ESA are outlined below.

Generally, development within an ESA-1 or -2 should be avoided or minimized. If this is unavoidable, an environmental impact assessment should be completed prior to development. Site-specific environmental impact assessments can provide detailed boundary delineation, comparison of alternatives, and assessment of long-term consequences.

Development in ESA-3 and ESA-4 should be minimized, with the end goal of improving ESA function to better meet criteria. Improvement can be through weed management programs, riparian fencing, review of grazing practices, reclamation with native plant species, buffering the perimeters of these ESAs, collaborating with conservation groups (e.g. Ducks Unlimited and Cows and Fish) and several other management strategies, such as those listed in Section 7.3.

ESA-1 (Very High Significance)

Generally, ESA-1 is considered pristine in its existing state, meeting several of the ESA criteria and with low levels of disturbance. Kneehill County should try to avoid or minimize development (including grazing, cropping, land clearing, oil and gas exploration and development, intensive recreational use, etc.) in these areas.

ESA-2 (High Significance)

ESA-2 is considered to be of high significance, and meet several ESA criteria but generally have low to moderate levels of disturbance. They may achieve ESA-1 classification if development activities are limited and if areas are reclaimed with native vegetation. As with an ESA-1, development in these areas should be avoided or minimized.

ESA-3 (Moderate Significance)

These areas are either moderately to highly impacted, are often small contiguous areas, and meet few criteria. Similar to ESA-2s, ESA-3 management strategies should help to move ESA-3s into a higher classification by meeting more of the criteria or improving upon their functioning condition. Development should be minimized in these areas.

ESA-4 (Low Significance)

These areas are labelled as low significance because they generally only meet one criterion and are highly disturbed. As with the ESA-3 areas, there is a possibility to improve ESA-4s with an effective management strategy and development should be minimized.

Non-ESA (Not Significant)

No specific management plans apply to non-ESA areas (anything outside of the delineated ESA-1 to 4). However, non-ESA areas may contain important natural features not designated because they are too small and/or fragmented. Despite their non-ESA status, these areas can support wildlife and provide ecological or hydrological functions. Furthermore, these areas are often numerous and could collectively comprise a large area. We recommend that natural features within non-ESAs be identified and managed accordingly; recommendations for each natural feature type are in Section 7.3.

Two primary examples of non-ESAs containing natural features are the small marshes, temporary wetlands and small fragmented forests that are concentrated in the northern and western portions of the County (most of the Central Parkland Subregion), and the wetlands in the south-eastern corner of the County. Wetland patches are within areas believed to support at least 20-30 waterfowl per square mile (McFarlane pers. comm. 2009). Management plans and practices can make use of the listed recommendations for wetlands in Section 7.3. Any developments that could impact one of these wetlands should refer to the *Water Act* and the provincial wetland policy (listed in Section 5.0).

Cottonwood Consultants (1991) provided these additional guidelines for ESA management:

- No major development should be permitted in ESAs due to detrimental impact or physical constraints;
- Long-term resource protection and management (and therefore long- term economic benefits) should have priority over short-term economic gains that result in the loss of future options;
- Recognizing a site as an ESA does not imply that it will be purchased by a public agency or that it is open for public use;
- Maintaining an environmental database is essential;
- In-depth studies may be necessary in those areas that are subject to development threats in the near future. Proactive actions are preferable to reactive ones;
- Buffers around an ESA may be necessary but cannot be prescribed until the proposed activity is known and its impacts assessed;
- ESAs should be recognized and included in official plans and not as an overriding development control over a variety of land use designations;
- Appropriate policies, plans and regulations must be adopted to ensure effective implementation and adherence to the priorities for ESAs; and,
- By-laws, policies and regulations should permit innovative approaches including management agreements with owners of ESAs (Eagles 1984 as cited in Cottonwood 1991).

7.2 MANAGEMENT OF NATURAL FEATURES

All natural features should be protected, regardless of ESA ranking, because even the lower ranked ESAs can become more valuable (and therefore higher ESA ranking) with proper management. Management practices that would benefit all natural feature types and the wildlife they support, include the following:

- Prevent introduction and control spread of noxious and invasive weeds via
    - mowing, pulling or, where appropriate, spraying with herbicide in infested areas, such as ditches and gravel pits

    - reclaiming disturbed areas by planting or reseeding with native species before invasive species are able to establish
    - minimizing disturbance to soil and native species to help prevent invasion and spread of weeds
    - encouraging education and public action to prevent spread of invasive weeds (e.g. via Beneficial Management Practices and the Environmental Farm Plan program (Kneehill County 2009));
- Control spread of agronomic species into ESAs by buffering perimeters;
- Avoid or minimize impacts of development and recreation on wildlife by complying with all federal and provincial legislation that protect wildlife and wildlife habitat, such as the *Migratory Birds Convention Act*, the Alberta *Wildlife Act*, and the *Water Act*; and,
- Manage development density (e.g. parcel size and number of parcels per quarter) and other land uses (e.g. appropriate range stocking rates, type and extent of industrial activity and resource extraction) – in some cases encouraging higher density developments may prevent increased footprints on the landscape.

Rare plants, ecological communities and wildlife must also be taken into consideration, although provincial guidelines currently have no legislative sanction. Rare plant and animal species listed under SARA are protected, and Recovery Plans include habitat management guidelines (Government of Canada 2002) (Table 4.1).

The Kneehill County Conservation Field officers can provide technical information about cost-effective, practical farm management methods that minimize environmental impacts, especially on natural features, from farming operations (Kneehill County 2009).

General recommendations for the management of each of the natural feature types are listed below. These lists are not exhaustive and their application does not ensure that regulatory requirements have been met. Refer to Section 5.0 for legislation affecting ESAs.

7.2.1 Water bodies

Rivers, Creeks and Streams

Due to the connectivity of rivers, creeks and streams, it is important to promote sound management of all of these waterways and drainages in order to maintain water quality and quantity and fish habitat. For this reason, all permanently wetted waterways were classified as ESA-1, ESA-2 or ESA-3. Only the most degraded tributaries (i.e. those that are dried and cultivated, or grazed and with a heavily disturbed riparian area) were assigned an ESA-4 due to their low habitat quality. These areas have the potential of being restored, thereby increasing their ranking to reflect an increase in function. It is also important to note that while some ephemeral waterbodies may not have been classified as ESAs due to the timing of the field assessments (some ephemeral areas may have been dry in the summer of 2009), these areas remain critical habitat features, and often have higher biodiversity and rare species due to the extreme conditions they must adapt to.

Effective management practices for water courses include the following:

- Refer to the Alberta Operational Statements for all land use and construction activities in or near streams (Fisheries and Oceans Canada 2009);
- Locate point source contamination sources, such as feedlots/intensive livestock operations away from watercourses, as per *Agricultural Operation Practices Act,* Standards and Administration Regulation (AR 267/2001), January 1, 2002;
- Maintain required setback distances or buffer zones from waterbodies and areas of known groundwater seepage or springs (Stantec Consulting Ltd. 2005) for confined feedlot operations (e.g. Section 3.0 of Municipal Development Plan, Kneehill County 2005)
- Maintain culverts to allow free water flow and safe fish passage;
- Enable fish passage through impoundments to allow upstream migration to spawning streams;

- Maintain a buffer zone of natural vegetation along streambanks and lakeshores to help control runoff into waterbodies (sedimentation, point sources, etc.) (see Section 5.2.2 for recommended management of riparian areas);
- Fence streambanks to prevent cattle from disturbing riparian areas, and to prevent water contamination and eutrophication;
- Do not direct sewer outfalls or other pollution sources (e.g., toxins or effluent) into spawning streams or their tributaries;
- Avoid depositing material on the bed or banks of spawning streams;
- Encourage residents and businesses to be aware of proper disposal of chemicals (i.e. not disposed of through the municipal wastewater system) and water conservation (through the Kneehill Watershed Advisory Council);
- Avoid herbicide use within 50 m of a water body;
- Use off-site watering for livestock (Cows and Fish 2009);
- Ensure farm operations, including calving, occur away from waterbodies; and,
- Develop and apply management plans for activities to control erosion and sedimentation of surface water (Longmore and Stenton 1981; Platts 1978 and 1979 as cited in Cottonwood Consultants 1991).

Also, under Part VII, Sections 32 and 33 of the Kneehill County Land Use Bylaw 1564, the following specific regulations pertaining to water body management apply:

- Keep new developments and expansion of existing developments outside of the 1 in 100 year floodplain of any watercourse or water body, as determined by Alberta Environment, unless it is a temporary or seasonal structure that is contained within an approved conceptual plan or site plan subject to conditions of the development permit; and,
- Do not develop any part of a building within 38.1 m (124 ft.) of a river, lake, stream or other permanent water body, unless permitted in an Area Structure Plan. The setback may be reduced if supported by a report submitted by a qualified engineer.

Lakes and Wetlands

Most of the management recommendations for rivers, creeks and streams stated above also apply to lakes and wetlands, including ephemeral water bodies that are important for groundwater recharge and wildlife habitat. The following additional recommendations apply specifically to lakes and wetlands:

- Maintain natural shorelines on wetlands for waterfowl nesting and foraging;
- Maintain culverts to allow free-flow of water and optimal fish passage;
- Use riparian fencing around temporary or permanent ponds lakes, both freshwater and alkaline, in areas with high livestock activity (i.e. Class II through VI wetlands);
- Prohibit drainage and cultivation of wetlands, and create or enhance wetlands where possible;
- Curtail land use during key times of year to avoid impacts to waterfowl nesting habitat (generally spring, and fall); and,
- Avoid, minimize or compensate (via restoration, construction or enhancement of wetlands) for any loss or degradation of a wetland.

Refer the Alberta Water Council's *Recommendations for a New Wetland Policy* (Alberta Water Council 2008), *Wetland Management in the Settled Areas of Alberta* (Alberta Water Resources Commission 1993b), and the *Provincial Wetland Restoration and Compensation Guide* (Alberta Environment 2007) for further details on strategies to mitigate and manage human impacts to Alberta's wetlands.

7.2.2 Riparian Areas

Management of riparian areas is essential to protect fish and wildlife, maintain water quality and continue to support recreational and agricultural activities. The health of riparian areas has declined dramatically in many areas of Alberta and North America since the early 1900s (Cows and Fish 2009). Strategies to protect riparian areas include the following:

- Maintain healthy buffer zones around streams with a setback distance appropriate for the type of land use, riparian health and ESA level of significance. The riparian

setback matrix model is a useful tool to determine setback distances (Lakeland County 2007);

- Leave native riparian vegetation communities intact;
- Maintain the continuity of riparian habitats by limiting clearing;
- Manage grazing to minimize disturbance (e.g., pugging (soil depressions) & hummocking (soil mounds) resulting from hoof action and compaction of soils; and excessive grazing) and allow time for forage re-growth by using low to moderate impact grazing techniques;
- Restore disturbed riparian vegetation with native shrubs and trees, and plant riparian buffers (e.g. through the PFRA Shelterbelt Trees program);
- Use riparian fencing to protect valuable riparian wildlife habitat and prevent cattle access
- Consider providing off-site water to avoid cattle congregating in riparian areas.
- Allow complete rest of partly degraded riparian areas to re-establish healthy plant communities, where possible;
- Protect critical ungulate winter ranges (including river valleys) and prevent disturbing wildlife while they occupy those ranges. If access or development is required into ungulate winter range areas, it should not occur during the sensitive window between January 1 and April 30 (ASRD 2000); and,
- Enhance streambank and shoreline stability with temporary erosion control structures, if required.

7.2.3 Aspen Forests

Patches of aspen forest should be protected from further fragmentation as plants and wildlife in these forests are better able to withstand disturbances from adjacent land use in larger blocks of habitat. Many of the management recommendations for riparian areas also apply to aspen forests, namely leaving native vegetation intact, stabilizing slopes with native

vegetation plantings and seeding, limiting forest clearing, and limiting cattle access; however, light grazing or mowing can help maintain the most significant plants and animals.

7.2.4 Native Grasslands

Native grasslands are already quite rare and fragmented in southern Alberta. Of particular concern is the loss of native rough fescue grasslands. An estimated 16 to 35 percent of the total area that these grasslands once covered before settlement remains intact. Furthermore, restoring and conserving these grasslands presents a number of technical difficulties. Reclamation of native rough fescue grasslands is very difficult and has a low success rate in Alberta (Foothills Restoration Forum 2009). Nevertheless, there are a number of management actions that can help preserve the remaining native grasslands:

- Avoid overgrazing by using seasonally-appropriate grazing rotations;
- Prescribe burning to discourage encroachment of aspen and shrubbery into native grasslands, and enhance growth of rare and other native grassland species (note: this requires the participation of Government agencies and the landowner);
- Control infestation of non-native invasive species, including smooth brome, timothy, Kentucky bluegrass and noxious and restricted weeds in native grassland areas using weed control methods, such as mowing, light grazing, controlled burning, or, if necessary, applying herbicide;
- Avoid prolonged exposure of bare soil by re-vegetating soils following disturbance with native seed mixtures; and,
- Avoid, limit, or strictly enforce mitigation of impacts if construction, recreation, or development is unavoidable in remnant native grasslands (e.g. implement erosion and sediment control plan, environmental monitoring, etc.).

7.2.5 Coulees and Badlands

Coulees and badlands are unique land features in the Province of Alberta, and there is a large proportion of them within the Kneehill County region. In addition to limiting cattle access,

controlling weeds, and stabilizing or vegetating disturbed soils with native vegetation, some special management considerations for coulees and badlands include the following:

- Direct development of permanent structures away from valley edges, protrusions and escarpments (Kneehill County 2005); and,
- Ensure land uses and developments are compatible with contiguous landscapes (e.g. guest ranches and low impact recreation that enable preservation of large areas of land).

7.3 MAJOR PHYSICAL CONSTRAINTS

Areas deemed to have major physical constraints to development ("Criteria 1" Section 2.2). are "hazard" lands. This includes areas that are unsafe for development in their natural state, such as floodplains and steep and unstable slopes; and, lands that pose severe constraints on types of development, such as aeolian (wind) soil deposits and permanent wetlands. These areas have been identified through aerial photo interpretation and field observations and were captured in determining the boundaries for the ESAs in the County.

Floodplains are found along major streams and rivers in Kneehill County. Steep slopes are concentrated in the southeast and along the eastern border in badlands and coulees. Aeolian deposits occur in the depressions of hummocky terrain that cover a large portion of the County. Aeolian deposits are made of fine particles and, if cleared of vegetation, are extremely susceptible to erosion and difficult to reclaim.

Management in areas with major physical constraints should be well defined to prevent irreversible impacts, and might include these elements:

- Restrict development on any slopes over 30%, or in permanent waterbodies;
- Buffers are recommended around areas with major physical constraints to limit potential for impact in the event of development. Buffers should be a minimum of 30 m, and wider depending on the sensitivity of the feature and the nature of the development;

- Any developments with potential for ground contamination (drilling, septic tanks and fields, etc.) should be restricted in river valley floodplains and other areas where alluvial deposits are present; and,
- Clearing should be prohibited on aeolian deposits.

7.4 MANAGEMENT OF HISTORICAL AND CULTURAL RESOURCES

All designated archaeological and palaeontological sites in Kneehill County should be considered for management as ESAs (Appendix D). Ranking these resources is not possible because their exact condition is not known and level of importance is subjective. The Historical Resources Branch of Alberta Culture and Community Spirit is responsible for administering the Alberta *Historical Resources Act* and determining whether Historical Resources Impact Assessments (HRIAs) are required (Temoin 2008).

Planners and land developers that could or will impact lands that contain recorded historical resources or that have been identified as having the potential to contain as yet unrecorded historical resources must seek the approval of Historic Resources at Alberta Culture and Community Spirit before finalizing development plans (Temoin 2008). If historical resources are accidentally encountered during development or related incidental activities, the developer must, according to the *Historical Resources Act*, report the finds to Alberta Culture and Community Spirit in Edmonton.

8.0 USE OF ESA MAPPING IN LAND USE PLANNING

The results of this study can facilitate and prioritize the management of ESAs in Kneehill County. The following list suggests ways in which the ESA updates can be used:

- Update the MDP to reflect the changes made to the ESAs (definitions and criteria) made in this report. Sections to update include
    - ESA policies in Section 9.0 (Open Space and Environment),

- definition of an ESA in Section 16.0 (Definitions), and
- map of existing features in the County (Schedule A).

- Assist landowners and developers to meet requirements of land use policies currently found in the Kneehill County MDP. ESAs are considered in the MDP in the following contexts:
    - ESAs, natural topography, landscape features, wetland and steep slopes need to be considered in site designs for proposed changes in land use designations, subdivision or development,
    - Confined Feeding Operations (CFO) cannot be created or expanded in or within close proximity to an ESA, unless it is demonstrated to the County's satisfaction that the proposed expansion will not have a detrimental impact on the ESA, and
    - Direct development of permanent structures away from valleys (brink of valley, protrusions, and escarpments) and the 1 in 100 year floodplain (Kneehill County 2005).
- Help determine suitable locations for environmental protection, such as Environmental Reserves (ER) and Environmental Reserve Easements (ERE), which may be required for land use district re-designations, subdivision or development under the *Municipal Government Act*. Other types of land designation that the ESA report could assist with are listed in the table of legal tools for municipalities to conserve environmentally sensitive areas (Appendix E). This document is intended to be used as a planning tool to provide options for the County and landowners when dealing with sensitive features.

Regional Guidelines

Kneehill County Agricultural Service Board (ASB) coordinates sustainable agriculture programming with assistance in grant funding and technical support from the Alberta Environmentally Sustainable Agriculture (AESA) program. Through the AESA extension programs and resources, Kneehill County ASB is encouraging on-farm adoption of Beneficial

Management practices (BMP) which are cost-effective, practical farm management methods that minimize environmental impacts. Kneehill County Agricultural Service Board concentrates its AESA programming in the following three areas: Support for the Alberta Environmental Farm Plan Program, Alberta's Water For Life Strategy Outcomes, and Alberta Climate Change Strategy Outcomes.

Other programs and strategies that could be utilized to update ESA information for Kneehill County include

- Environmental Farm Plan
- Kneehill Watershed Advisory Council
- Red Deer River Watershed Alliance
- The ESA maps and supporting information can be used to identify priority areas for environmental management programs, such as the riparian fencing and off-site watering programs.
- The updated ESAs are more extensive and provide additional information that is not included in the provincial ESAs. This update ESA layer could be a useful tool to support decision-making in land-use planning and environmental stewardship for the new regional plans under the Land Use Framework
- The ESA mapping, significance rankings, supporting information and management considerations can be published to educate and foster awareness of ESAs among agencies and the public and to encourage and facilitate involvement in responsible land management.

A number of legal tools are available to conserve ESAs. Appendix E lists an example of some of these tools along with the advantages and disadvantages of each. The County should work with applicable provincial and federal agencies to ensure land uses and development do not interfere with the goal of protecting ESAs while maintaining economic opportunities and landowner rights.

9.0 CONCLUSIONS AND RECOMMENDATIONS

The review and update of the Environmentally Significant Areas (ESA) for Kneehill County (original report, Cottonwood Consultants 1991) provides the County with updated mapping, tools and management strategies for the new ESAs. Determination of ESAs and ranking of significance levels followed a standardized protocol, resulting in a total area of 45,908 ha of ESAs designated in the County. Management recommendations of ESAs, are made according to their level of significance and natural feature type, within the context of applicable legislation.

9.1 DATA GAPS

There is limited information specific to Kneehill County regarding rare or endangered plant and animal species, which may be due to lack of surveys in the areas or limited habitat available for rare and endangered species. The limited scope and timing restraints of the project did not allow for specific surveys, such as ungulate browse, rare plant of rare ecological community, breeding bird, raptor, etc. As well, Alberta breeding bird atlas data is available for portions of the County where surveys have been completed; however this information must be used with caution, as while it confirms the presence of species in an area, the lack of data for all areas of the County may create a false assumption that birds are not nesting in an area.

Additional detailed mapping of the riparian areas within Kneehill County would provide more information about those areas that require management, especially outside of ESA designated areas. More detailed mapping would provide an added layer of precision to use in conjunction with the ESA mapping database.

9.2 FUTURE RESEARCH

Future research will be linked with changes in legislation, technology and landscape. Depending on Kneehill County initiatives, the ESA mapping and ranking should be repeated in 10 to 20 years and contrasted to current mapping. The County should continue to acquire

data as it becomes available, including: breeding bird atlas data, Alberta Natural Heritage Information Centre data (rare plant, animals and rare ecological community locations), and wetland/riparian mapping data. As well, municipal plans regarding local ecology and future environmental impact assessments should be an iterative process, involving local biologists.

9.2.1 Changes in Legislation

As the Land Use Framework (Government of Alberta 2009b) has recently been finalized and put into force through the passing of the *Land Stewardship Act* (Bill 36), the formulation of regional plans and regional planning committees is underway. With the enactment of Bill 36, amendments to 27 supporting acts will require changes and updates to conform with the new *Act*, including the *Municipal Government Act*, *Agricultural Operations Practices Act, Environmental Protection and Enhancement Act, Historical Resources Act, Public Lands Act, Wilderness Areas, Ecological Reserves, Natural Areas and Heritage Rangeland Act,* and the *Wildlife Act* (among others).

Under the formation of the Regional Planning Committees, Kneehill County falls under the Red Deer Region, and regional planning for this area is proposed to be completed by 2012. The land-use framework process has proposed opportunities for municipalities to be involved in the planning (Government of Alberta 2009b). The mapping and ranking of ESAs in Kneehill County enables recognition of areas that require conservation and where management should be focused. Provincial and federal requirements for sustainability and protection laws continually evolve and trend towards better protection of ecological attributes. In the case of proposed development in an ESA-1 or 2, completing an environmental impact assessment would ensure the application of the most recent legislation.

Upcoming enforcement of the Alberta Wetland Policy may also affect the designation of all wetlands within the province, and will likely outline management conditions when initiating activities in and around water bodies. For more information, refer to Section 5.11.

9.2.2 Changes in Technology

Inevitably, more up to date colour imagery will be available for the County, along with comprehensive GIS programs to analyze data. New technology such as infrared imagery (plant type distinction) would further refine ESA mapping potential. As data become more available digitally, layers of information on weeds, land use, watersheds, riparian fencing, etc. could be combined to create an algorithm to calculate ESAs at a desktop level, which could be revised based on field observations.

9.2.3 Changes in the Landscape

Landscapes change naturally and through human-made disturbance. Natural succession of vegetation communities and meandering rivers creating new cut banks and sand depositions are examples of inevitable natural changes to the landscape. Resource extraction and changing agri-business practices (e.g. to organic or agro-forestry practices) are examples of human-made changes in the landscape. These changes can be captured in future ESA mapping.

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Appendix A

Field Sheet Template

ESA # :

Summit Environmental Consultants Ltd. **Kneehill County Field Assessments**

Project #7513-001.01 Mapbook Sheet #: Date of Assessment:_____

Location description:

_____

Criteria: _____

- ☐ Hazard Lands
- ☐ Vital Function
- ☐ Rare Features
- ☐ Rare Species
- ☐ Unique Habitats
- ☐ Diversity
- ☐ Lge Undisturbed Habitat
- ☐ Linking & Migration
- ☐ Representative Ecosystem
- ☐ Intrinsic Appeal
- ☐ Scientific Research
- ☐ Historical Importance

Structure (%)*	**Stand Characteristics (if treed)**
Site Name:	
Ecoregion/subregion	Topographic Location:
Ecosite Phase	Wpt (NAD 83): N
Natural Feature Type:	E
Photo (time/date):	Slope:
Moisture Regime:	Aspect:
Canopy	Canopy height
Sub Canopy	Sub canopy height
Understory	DBH
Forb	Age
Lichen/Moss	Species (cored)
Rock/exposed soil	
CWD	

*to add to 100%

Wetland Classification:

- ☐ Ephemeral Wetland (I)
- ☐ Temporary Wetland (II)
- ☐ Seasonal Ponds/Lakes (III)
- ☐ Semi-Permanent Ponds/Lakes (IV)
- ☐ Permanent Ponds/Lakes (V)
- ☐ Alkali Ponds/Lakes (VI)
- ☐ Fen Ponds (VII)

General Vegetation Health: ☐ Stressed ☐ Fair ☐ Healthy ☐ Very Healthy

Surrounding Disturbance: ☐ Agricultural ☐ Transportation ☐ Residence ☐ Other

References/Comments:

_____

_____

_____

Possible significance:

_____

_____

Management Considerations:

_____

_____

Site Sketch

Species:

Trees									
Picea glauca		*Populus balsamifera*							
Picea mariana		*Populus deltoides*							
Pinus banksiana		*Populus tremuloides*							
Shrubs									
Amelanchier alnifolia		*Potentilla fruticosa*							
Cornus canadensis		*Prunus virginiana*							
Corylus cornuta		*Rosa acicularis*							
Elaeagnus commutata		*Salix spp.*							
Juniperus horizontalis		*Symphoricarpos occidentalis*							
Forbs/grasses/sedges/herbs									
Agropyron dasystachyum		*Calamovilfa longifolia*		*Geranium viscosissimum*		*Stipa comata*			
Agropyron smithii		*Carex siccata*		*Geum triflorum*		*Stipa curtiseta*			
Agropyron trachycaulum		*Carex spp.*		*Helictotrichon hookeri*		*Stipa spartea*			
Anemone patens		*Danthonia parryi*		*Koeleria macrantha*		*Thermopsis rhombifolia*			
Aralia nudicaulis		*Deschampsia cespitosa*		*Ledum groenlandicum*		*Typha latifolia*			
Arctostaphylos uva-ursi		*Festuca campestris*	.	*Linum lewisii*					
Artemisia frigida		*Festuca hallii*		*Lupinus argenteus*					
Artemisia ludoviciana		*Festuca idahoensis*		*Maianthemum canadense*					
Bouteloua gracilis		*Galium boreale*		*Scirpus spp.*					
Weeds									
Noxious				**Nuisance**					
Chrysanthemum leucanthemum		*Lychnis alba*		*Agropyron repens*		*Galeopsis tetrahit*		*Setaria viridis*	
Cirsium arvense		*Matricaria maritima*		*Amaranthus retroflexus*		*Lappula echinata*		*Silene noctiflora*	
Convolvulus arvensis		*Sonchus arvensis*		*Avena fatua*		*Linaria dalmatica*		*Sinapis arvensis*	
Echium vulgare		*Tanacetum vulgare*		*Bromus inermus*		*Malva rotundifolia*		*Sonchus oleraceus*	
Euphorbia esula				*Bromus tectorum*		*Neslia paniculata*		*Stellaria media*	
Galium aparine				*Descurainia sophia*		*Polygonum convolvulus*		*Taraxacum officinale*	
Galium spurium				*Erucastrum gallicum*		*Salsola pestifer*		*Thlaspi arvense*	
Linaria vulgaris				*Fagopyrum tataricum*		*Saponaria vaccaria*			
Non-Vascular									

D: Dominant (>=5%); L: limited (<=5%); T: Trace (<=1%); I: Invasive (Agronomic/nuisance); N: Noxious

Appendix B

Key Element Occurrences and Fish Species in Kneehill County

Key Element Occurrences in Kneehill County from Alberta Natural Heritage Information Centre (ANHIC), September 5, 2008

LSD Location (Township-Range- North/South)	Acarospora arenacea	Agrestia hispida	Almutaster pauciflorus	Atriplex canescens	Atriplex powellii	Bromus latiglumis	Caloplaca flavovirescens	Cetraria arenaria	Cladonia ramulosa	Desmatodon heimii	Desmatodon randii	Didymodon fallax	Diplotomma alboatrum	Ellisia nyctelea	Fulgensia fulgens	Icaricia shasta	Lecanora wisconsinensis	Lecidea confluens	Lecidea lithophila	Mannia fragrans	Microtus ochrogaster	Notropis blennius	Onychomys leucogaster	Peltigera horizontalis	Peltigera polydactyla	Phascum cuspidatum	Pterygoneurum subsessile	Rana pipiens	Satyrium acadicum	Sphenopholis obtusata	Viola pedatifida	Xanthoparmelia subdecipiens
27-20-N															1																	
28-20-N								1								1																
28-21-N	2	2					2		6				2			5	2	10	3					2								8
28-21-S																									1							
29-20-S								2								2						1							2			
29-21-N																						1										
29-21-S																						1										
29-23-S																												1				
29-26-N																							1									
30-21-N				3	2																	2										
30-21-S																						1										
30-26-S																							1									
31-21-N																						1										
31-21-S				1																		1										
31-26-N																					1											
32-21-N																						1										
32-21-S																						1										
32-26-S																					1											
32-27-S																					1											
33-22-N																						1										
33-22-S																						1										
34-21-N			1			1		5						9		1				9		3				9	9			1	2	
34-22-N								3						1						1		1				1	1					
34-22-S								2														2										
34-23-S										1	1	2																				

NOTE: Number in cell indicates number of occurrences in that location. Areas where occurrences overlapped multiple LSDs show values in multiple LSD cells. (ANHIC 2008)

Latin and common names of ANHIC recorded element occurrences

Latin Name	Common Name	Latin Name	Common Name
Acarospora arenacea	Cracked lichen	Lecanora wisconsinensis	Wisconsin rim lichen
Agrestia hispida	Vagabond lichen	Lecidea confluens	Licedea lichen
Almutaster pauciflorus	Few-flowered aster	Lecidea lithophila	Licedea lichen
Atriplex canescens	Saltbush	Mannia fragrans	Liverwort
Atriplex powellii	Powell's saltbush	Microtus ochrogaster	Prairie vole
Bromus latiglumis	Canada brome	Notropis blennius	River shiner
Caloplaca flavovirescens	Sulphur fire-dot lichen	Onychomys leucogaster	Northern grashopper mouse
Cetraria arenaria	Sandwort cetraria lichen	Peltigera horizontalis	Flat-fruited pelt
Cladonia ramulosa	n/a	Peltigera polydactyla	Many-fruited pelt
Desmatodon heimii	Long-stalked beardless moss	Phascum cuspidatum	Cuspidate earth moss
Desmatodon randii	Rand's desmatodon moss	Pterygoneurum subsessile	Sessile pterygoneurum moss
Didymodon fallax	Fallcious screw moss	Rana pipiens	Leopard frog
Diplotomma alboatrum	n/a	Satyrium acadicum	Acadian hairstreak
Ellisia nyctelea	Waterpod	Sphenopholis obtusata	Prairie wedge grass
Fulgensia fulgens	Scrambled-egg lichen	Viola pedatifida	Crowfoot violet
Icaricia shasta	Shasta blue	Xanthoparmelia subdecipiens	Xanthoparmelia lichen

Results From Fisheries Management Information Search, October 7, 2008

Waterbody	FTMN	BRST	RNTR	LKCH	PRDC	LNDC	LNSC	WHSC	NRPK	GOLD	SHRD	BURB	WALL	EMSH	MOON	SAUG	RVSH	QUIL	MNWH	FLCH
Wimborne Fish Pond	X	X	X																	
Threehills Creek	X	X		X	X	X	X	X												
Ghostpine Creek	X	X		X	X	X		X	X											
Red Deer River				X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Kneehills Creek	X	X		X		X		X												
Lonepine Creek	X	X		X				X												
Rosebud River				X		X	X													X
Trib to Kneehills	X	X																		
Trib to Lonepine	X	X																		

X – indicates presence in that waterbody (FWMIS 2008)

Definition of Acronyms

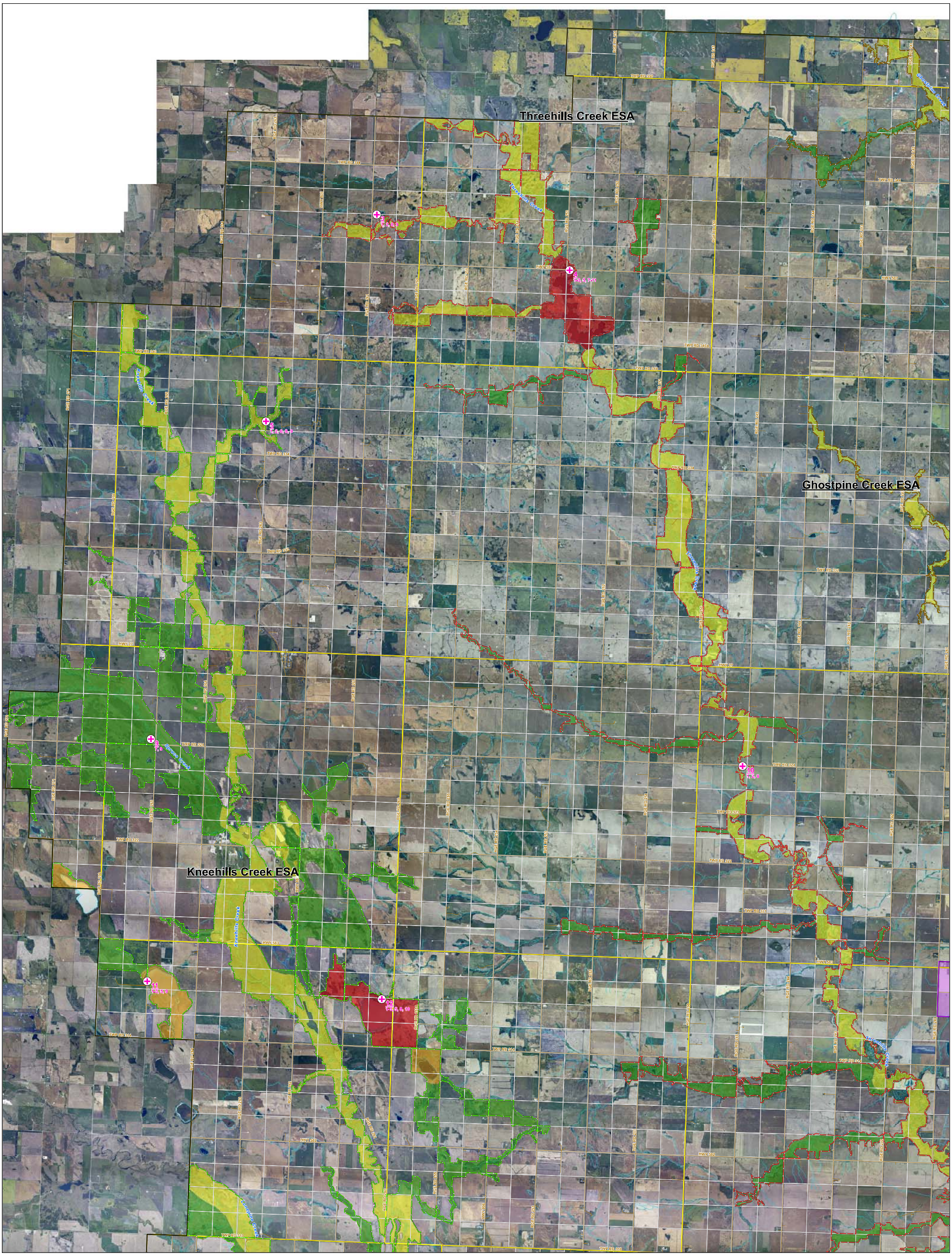
Abbreviation	Common Name	Abbreviation	Common Name
FTMN	Fathead Minnow	SHRD	Shorthead Redhorse
BRST	Brook Stickelback	BURB	Burbot
RNTR	Rainbow Trout	WALL	Walleye
LKCH	Lake Chub	EMSH	Emerald Shiner
PRDC	Pearl Dace	MOON	Mooneye
LNDC	Longnose Dace	SAUG	Sauger
LNSC	Longnose Sucker	RVSH	River Shiner
WHSC	White Sucker	QUIL	Quillback Sucker
NRPK	Northern Pike	MNWH	Mountain Whitefish
GOLD	Goldeye	FLCH	Flathead Chub

Appendix C

Kneehill County ESA

Maps

Kneehill County Environmentally Significant Areas 2009



N
W E
S

Kneehill County

SUMMIT ENVIRONMENTAL CONSULTANTS LTD.

Legend

- County Boundary
- Municipal Boundary
- Field assessment location with site card ID and criteria applicable to that site (e.g. 3, 5-8, 11)

ESA Classification

- 1 (Very High)
- 2 (High)
- 3 (Moderate)
- 4 (Low)

ESA Areas

- Drumheller Badlands
- Ghostpine Creek
- Kneehills Creek
- Rosebud River
- Threehills Creek
- Tolman Badlands
- Unnamed ESA

ESA Criteria*

1 Hazard lands and areas unsafe to develop (ie floodplains, steep or unstable slopes)
2 Vital environmental, ecological or hydrologic functions
3 Areas with rare or unique geological or physiographic features
4 Areas which contain significant, rare or endangered species
5 Unique habitats or remnants of once large habitats
6 Areas with unusually high diversity
7 Areas with large and relatively undisturbed habitats
8 Areas that provide a linking function and permit movement for wildlife
9 Areas that are excellent representatives of one or more ecosystems or landscapes that characterize a natural region
10 Areas with intrinsic appeal or widespread community interest
11 Areas with histories of scientific research
12 Areas of historical importance

*These criteria were used to help determine level of significance

Sources: Kneehill County, and the Government of Alberta

Projected in NAD 1983, UTM Zone 12
Orthophotos taken 2007.

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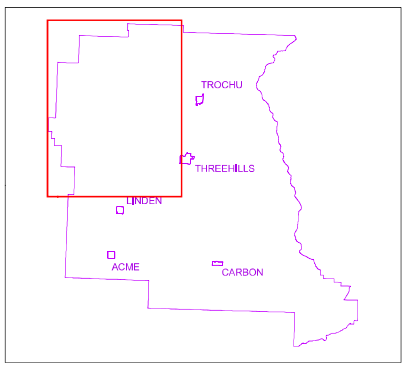
Kilometers



Kneehill County Environmentally Significant Areas 2009

Ghostpine Creek ESA

Unnamed ESA

Tolman Badlands ESA

TROCHU

THREE HILLS

Threehills Creek ESA

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Kneehill County

SUMMIT ENVIRONMENTAL CONSULTANTS LTD.

Legend

County Boundary

Municipal Boundary

Field assessment location with site card ID and criteria applicable to that site

ESA Classification

1 (Very High)

2 (High)

3 (Moderate)

4 (Low)

ESA Areas

Drumheller Badlands

Ghostpine Creek

Kneehills Creek

Rosebud River

Threehills Creek

Tolman Badlands

Unnamed ESA

ESA Criteria*

1 Hazard lands and areas unsafe to develop (ie floodplains, steep or unstable slopes)
2 Vital environmental, ecological or hydrologic functions
3 Areas with rare or unique geological or physiographic features
4 Areas which contain significant, rare or endangered species
5 Unique habitats or remnants of once large habitats
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Projected in NAD 1983, UTM Zone 12
Orthophotos taken 2007.

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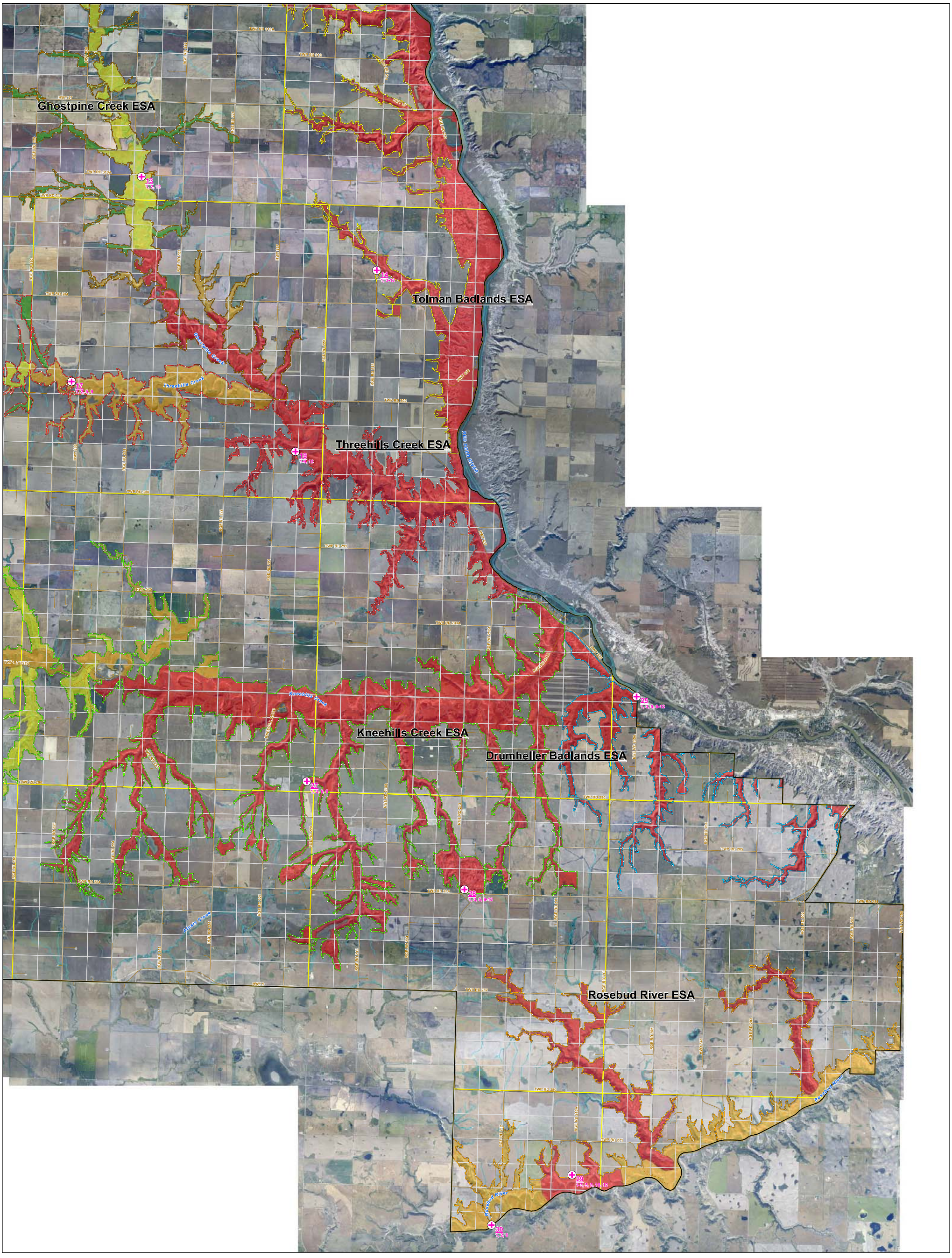
THREEHILLS
LINDEN
ACME
CARBON

Kneehill County Environmentally Significant Areas 2009



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Kneehill County

SUMMIT ENVIRONMENTAL CONSULTANTS LTD.

Legend

- County Boundary
- Municipal Boundary
- Field assessment location with site card ID and criteria applicable to that site (e.g. 3, 5-8, 11)

ESA Classification

- 1 (Very High)
- 2 (High)
- 3 (Moderate)
- 4 (Low)

ESA Areas

- Drumheller Badlands
- Ghostpine Creek
- Kneehills Creek
- Rosebud River
- Threehills Creek
- Tolman Badlands
- Unnamed ESA

ESA Criteria*

1 Hazard lands and areas unsafe to develop (ie floodplains, steep or unstable slopes)
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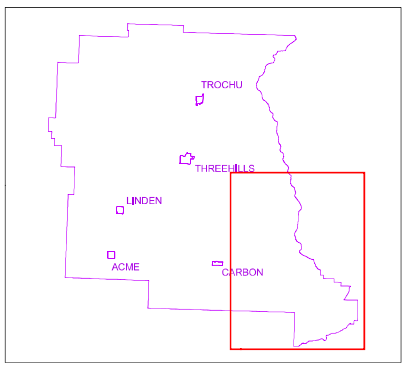
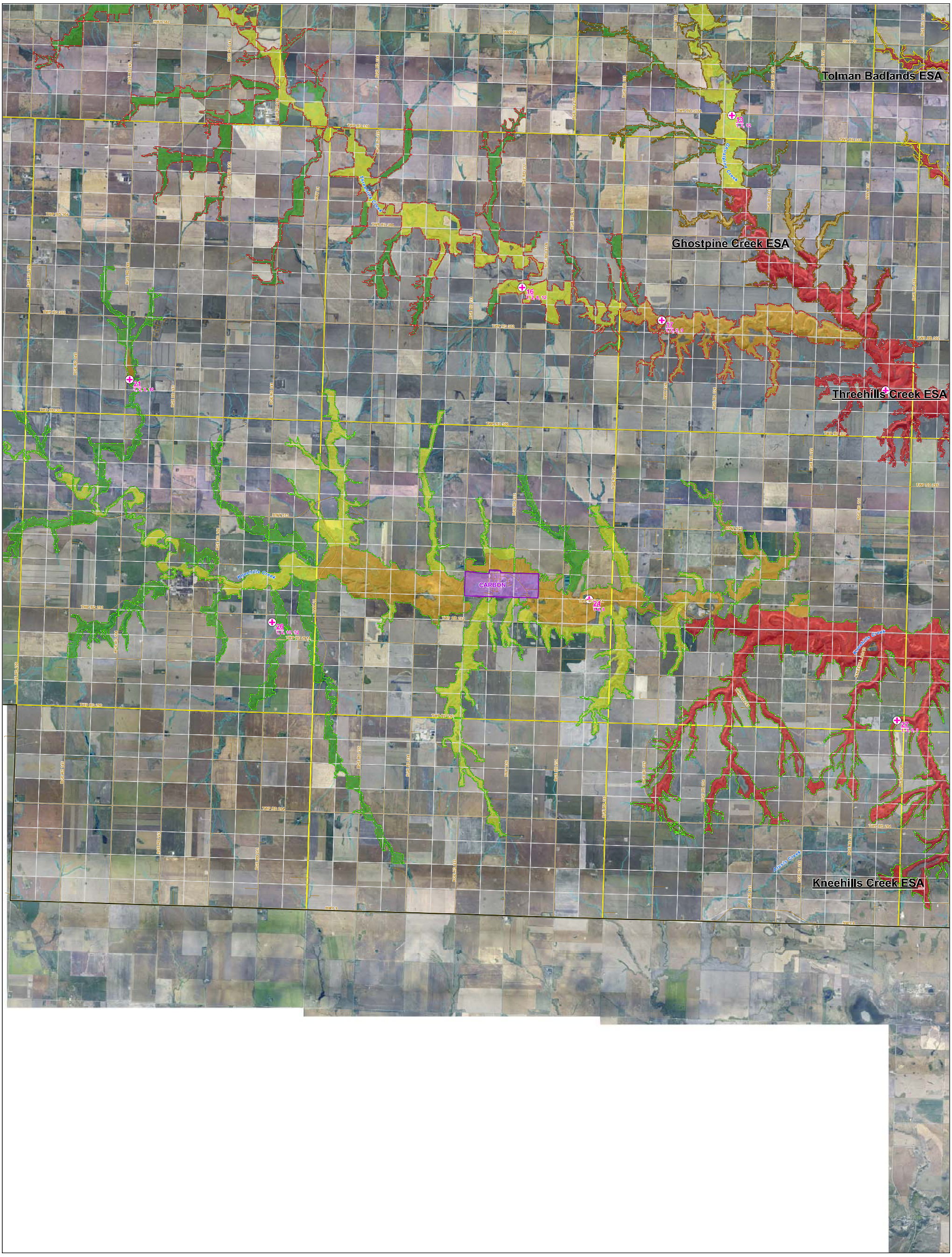


Kneehill County Environmentally Significant Areas 2009



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Kneehill County

SUMMIT ENVIRONMENTAL CONSULTANTS LTD.

Legend

County Boundary

Municipal Boundary

Field assessment location with site card ID and criteria applicable to that site

ESA Classification

1 (Very High)

2 (High)

3 (Moderate)

4 (Low)

ESA Areas

Drumheller Badlands

Ghostpine Creek

Kneehills Creek

Rosebud River

Threehills Creek

Tolman Badlands

Unnamed ESA

ESA Criteria*

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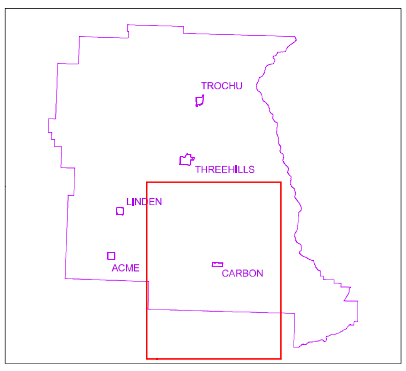
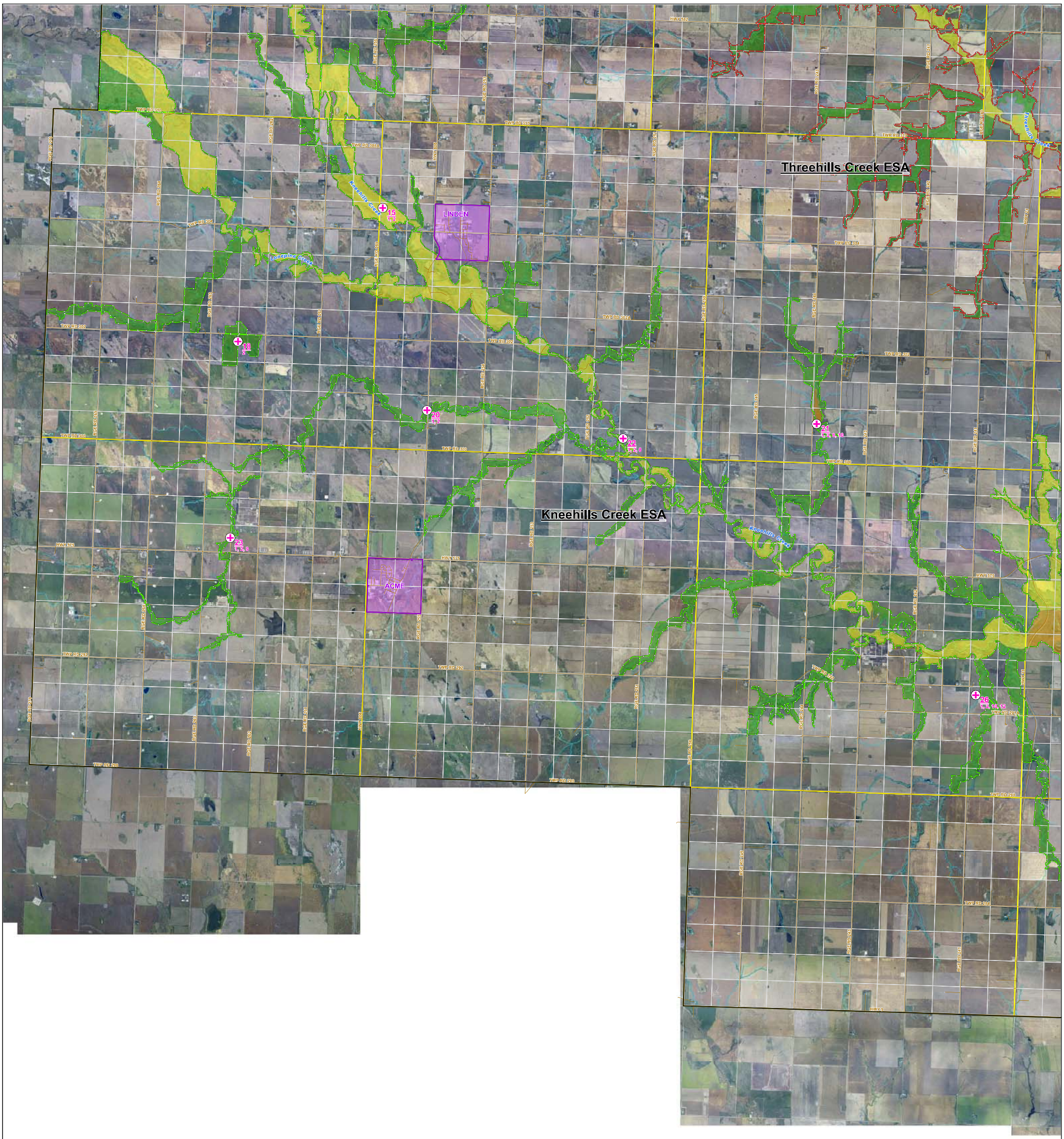


Kneehill County Environmentally Significant Areas 2009



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Kneehill County

SUMMIT ENVIRONMENTAL CONSULTANTS LTD.

Legend

County Boundary

Municipal Boundary

Field assessment location with site card ID and criteria applicable to that site

ESA Classification

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ESA Areas

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Ghostpine Creek

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Rosebud River

Threehills Creek

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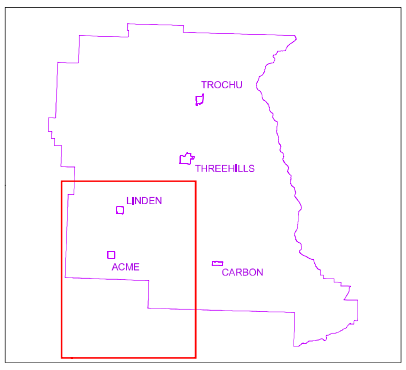

Appendix D

Historical Resources Report

Arrow Archaeology Limited

Appendix E

Legal Tools for Municipalities to Conserve Environmentally Sensitive Areas

LEGAL TOOLS FOR MUNICIPALITIES TO CONSERVE ENVIRONMENTALLY SENSITIVE AREAS

(Adapted by City of Calgary from Kwasniak, A. 2001. *Alberta Wetlands – A Legal & Policy Guide.* Environmental Law Centre and Ducks Unlimited Canada.)

Note: This is a general summary of some of the tools available for conservation. Not all of these mechanisms may be applicable or appropriate to the protection of riparian areas or other environmentally significant lands.

Tool	Advantages	Disadvantages	Notes
Administrative and Planning Tools			
Municipal Reserve	• May be required by the subdivision authority as a condition for subdivision • Simple • Not costly to municipality	• Is only triggered by an application for subdivision • Amount of land is limited by ss. 666 and 668 of *Municipal Government Act*	• Priority generally given school sites, neighbourhood parks and other open space needs (see *Open Space Plan*)
Environmental Reserve	• May be required by the subdivision authority as a condition for subdivision • High degree of protection • Simple, difficult to undo • Not costly to municipality	• Is only triggered by an application for subdivision • Must comply with s. 664(1) of MGA so does not apply to all environmentally sensitive land	•
Environmental Reserve Easement	• If the owner and city agree can replace the environmental reserve • High degree of protection • Simple • Flexible • Not costly to municipality	• Is only triggered by an application for subdivision • Costly to the proponent as the easement is granted without compensation • Must comply with s. 664 of MGA so does not apply to all environmentally sensitive land	• Environmental reserve easement is dedicated without compensation • Title stays in name of proponent
Natural Area Land Use Designation under Land Use Bylaw of City and other exercising of municipal authority involving down-zoning to regulate land use	• Uses the City Land Use Bylaw and zoning powers • Simple, flexible • Binds future owners unless changed by City • If a legitimate use of zoning powers no compensation is payable	• May be politically • Requires the definition of new land use category • Can be changed by City • Down-zoning must be in pursuit of long-term planning objectives	• See s. 640 of *Municipal Government Act* • Case law has shown that there is ample scope to down-zone land for protection of environment without having to pay any compensation. See F. Laux, *Planning Law and Practice in Alberta*, Second Edition, Chapter 8.

Tool	Advantages	Disadvantages	Notes
Conservation Easements			
Sale of Conservation Easement to City, other government, ENGO[1].	• Simple, Flexible protection • Binds future owners • Less costly than sale of land itself • City does not bear responsibility for management if Cons. Easement granted to a third party • Terms of the agreement can be modified by agreement	• Voluntary • Costly to recipient • Easement must fit within purpose set out in the *Environmental Protection and Enhancement Act* (EPEA) • Easement can be terminated by agreement or by the Minister of Environment	• The City, Alberta or government agencies qualify to accept a grant of a conservation easement. • ENGO must be a qualified organization as set out in the EPEA
Gift of Conservation Easement to City or other organisation	• Simple, flexible • High degree of protection • Binds future owners • Tax benefits, esp. if deemed an ecological gift • Less costly than sale of land itself • Terms can be modified by agreement • City does not bear responsibility for management if granted to a third party	• Voluntary • Easement must fit within a purpose set out in EPEA • For best tax benefits must qualify as an ecological gift • Costly to land owner	• An ecological gift can be an easement if certified by the Minister of the Environment to be ecologically sensitive • ENGO must be a qualified organization as set out in the EPEA
Donation/Sale of property for park establishment			
Sale to the City/ENGO	• Simple, flexible protection • High degree of protection possible • City does not bear responsibility for management if sold to a third party • Less costly to City and proponent	• Costly for the City/ENGO • Owner must be willing to sell • Does not bind future owners • Development still possible	
Gift to City/ENGO	• Simple, flexible protection • Tax benefits • Could be an ecological gift • City does not bear responsibility for management if donated to a third party • Less costly to City and proponent	• Potentially costly to Owner • Land owner must be willing to give the land • For best tax benefits must qualify as an ecological gift •	• An ecological gift must be land that is certified by the federal Minister of the Environment to be ecologically sensitive land. •
Personal, term and common law partial interests			
Voluntary action by owner to refrain from or limit development	• Simple	• Easy to undo owners • Expensive to land owner • Limited protection	

[1] Environmental Non-government Organisation

Tool	Advantages	Disadvantages	Notes
Lease to City, or other party	• Simple, flexible • Unlikely to be undone during term of lease • City carries out monitoring, upkeep and enforcement • City does not bear responsibility for management if leased to a third party • Less costly to City and proponent	• Could be costly to City, or third party • Leases usually must be of an entire parcel and not to part of a parcel • Land owner must be willing to lease land • No protection after term expires	• Must be registered at Land Titles if for over three years in order to bind future purchasers
License to City or ENGO	• Owner could give a license to enter onto land to carry out a conservation program	• Is not an interest in land, so does not bind future purchasers • Could be costly to City or ENGO • No protection after term expires	
Profit à Prendre to City or ENGO (right to enter onto land and take some "profit" of the soil)	• Owner could give City or ENGO exclusive right to trees or other vegetation—no one else may remove vegetation • City/ENGO carries out monitoring, upkeep and enforcement • High degree of protection if rights not exercised • Could be for a term or granted in perpetuity	• Could be costly to City/ENGO to purchase right • Conservation goal only realized if City/ENGO chooses not to exercise right • Land owner must be willing to sell a profit à prendre	• Profits à prendre are interests in land and bind subsequent purchasers if registered on title
Common law Easement from owner regarding neighbouring land	• Binds future owners • May contain positive or negative covenants • Less expensive than sale of land itself • Could be for a term or be granted in perpetuity	• Easement on a parcel (servient tenement) must benefit another land (dominant tenement) • Can be undone by owner of the dominant tenement	• See ss.71 & 72 of *Land Titles Act*
Restrictive Covenant regarding neighbouring land	• Binds future owners • Less expensive than sale of land itself • Could be for a term or granted in perpetuity	• Restriction on one parcel (servient tenement) must benefit another parcel (dominant tenement) • Covenants can only be negative and not positive • Can be undone by owner of dominant tenement • Can be removed by the Court in the public interest	• See s. 52 of *Land Titles Act*

Tool	Advantages	Disadvantages	Notes
Park Designation			
Sale to federal government for park dedication[2]	• High degree of protection • Difficult to undo • Flexible protection • Federal government responsible for monitoring, upkeep and enforcement • Tax benefits if a gift of capital property • Could be an ecological gift	• Dependent on action from the federal government • Provincial government must agree • Costly to the federal government • Difficult to meet criteria	• See the *Canada National Parks Act*, the *Migratory Birds Convention Act*, the *Canada Wildlife Act*
Sale to provincial government as a park[3]	• Varying degrees of protection depending on designation • Some designations are difficult to undo • Flexible protection • Provincial government carries out monitoring, upkeep and enforcement • less costly to City and proponent	• Dependent on action from the provincial government • Costly to the provincial government • Difficult to meet criteria	• See the *Wilderness Areas, Ecological Reserves and Natural Areas Act*, the *Provincial Parks Act* and the *Wildlife Act*

[2] Could be designated as a national park, park reserve, national historic site, migratory bird sanctuary or national wildlife area
[3] Could be designated as a provincial park, wildlands park, recreation area, ecological reserve, natural area, wilderness area or wildlife sanctuary