that will minimize agriculture's impact on the environment. Adoption of these practices is more likely to be accomplished if producers are informed of the issues and understand their options for improving management practices. Alberta Agriculture, Food and Rural Development, in partnership with the agricultural industry, should accelerate the development of education and awareness programs that will provide objective, science-based phosphorus management recommendations that producers can implement for their specific operations. The education and awareness program should also work with crop producers throughout Alberta to promote the significant advantages of using manure as a nutrient source.

7. ***Develop and implement a manure management incentive program for Alberta livestock producers.***

   Implementation of soil-test phosphorus limit regulations could result in significant financial hardship to Alberta's intensive livestock industry, particularly the beef feedlot industry. Having an adequate land base to spread manure within a reasonable distance from the feeding operation is already a challenge for many confined feeding operations. If the industry is forced to move towards a phosphorus-based manure management program, even greater land base challenges will occur. These challenges will be greatest for those geographic regions where the historical development of confined feeding operations resulted in feeding operations being located relatively close to each other. Providing a transitional funding support program will reduce manure applications on existing land by promoting the transportation of excess manure greater distances. In addition, it will promote the significant benefits of manure to a greater area of cropland in the province, and reduce overall phosphorus losses to streams and rivers.

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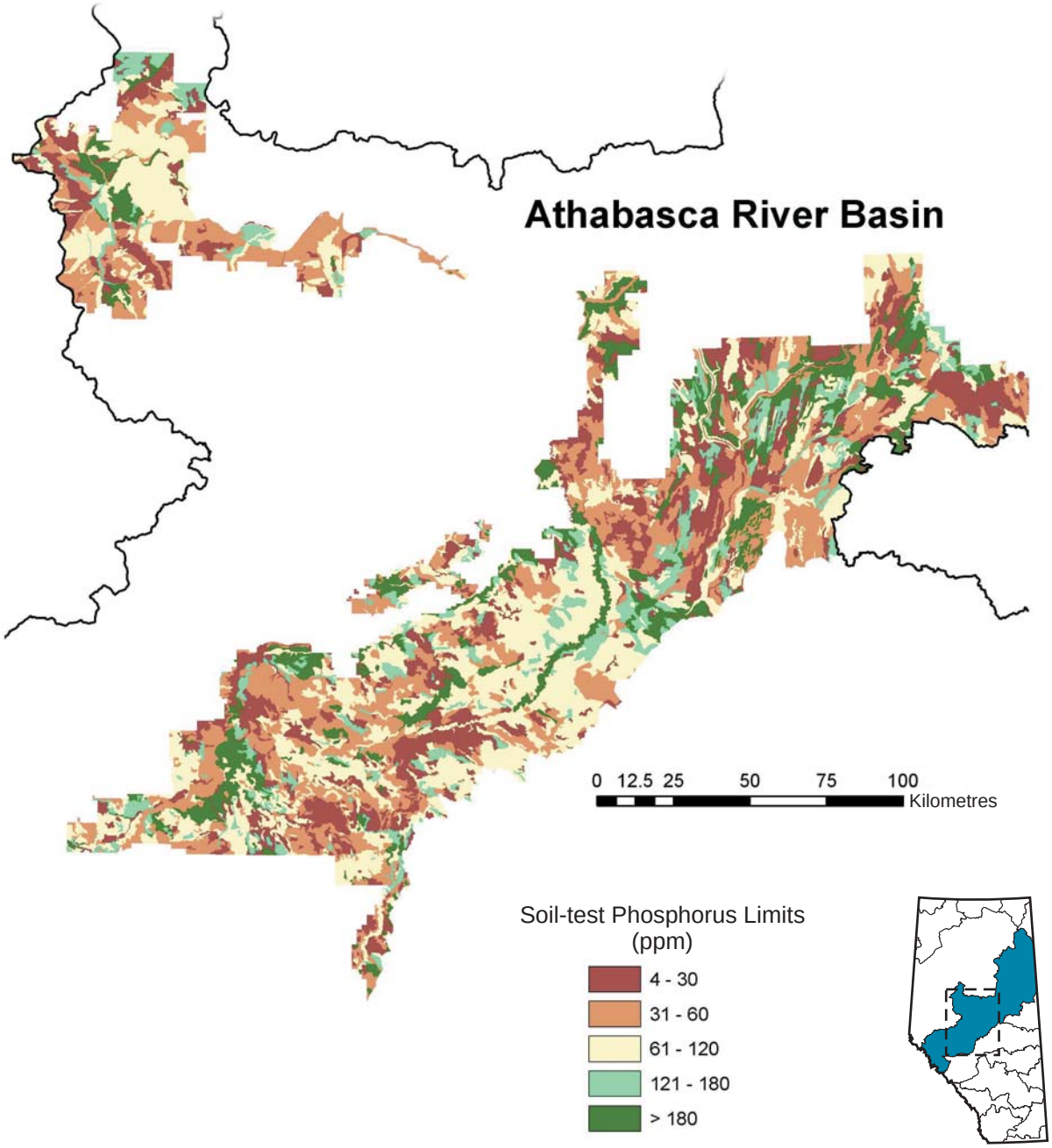
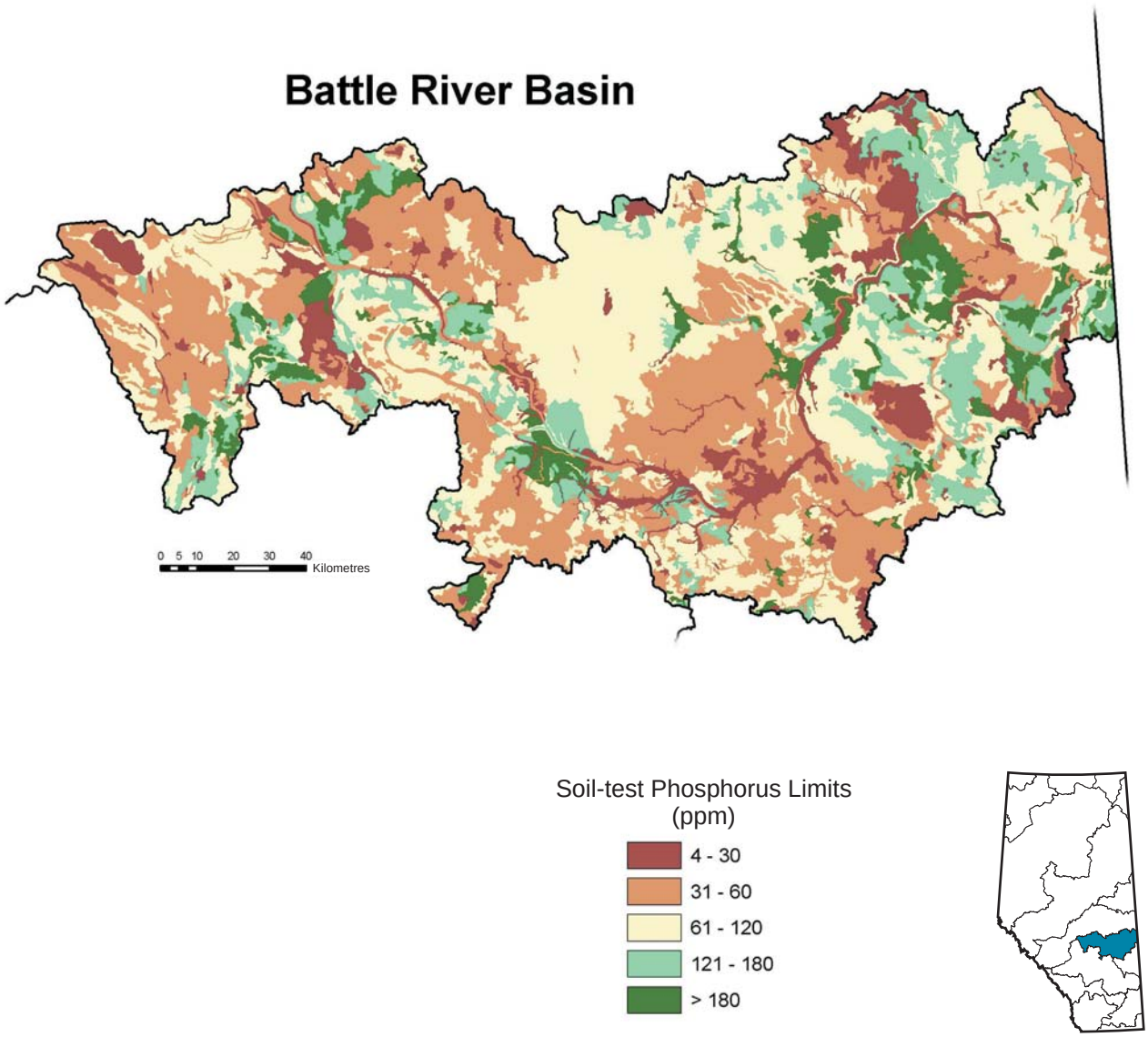
Appendices

Appendix 1. Calculated soil-test phosphorus limit watershed maps for the main drainage basins in Alberta



Calculated soil-test phosphorus limits in the 0 to 15 cm soil layer for the Athabasca River Basin using a total phosphorus runoff water quality limit of 1.0 ppm.



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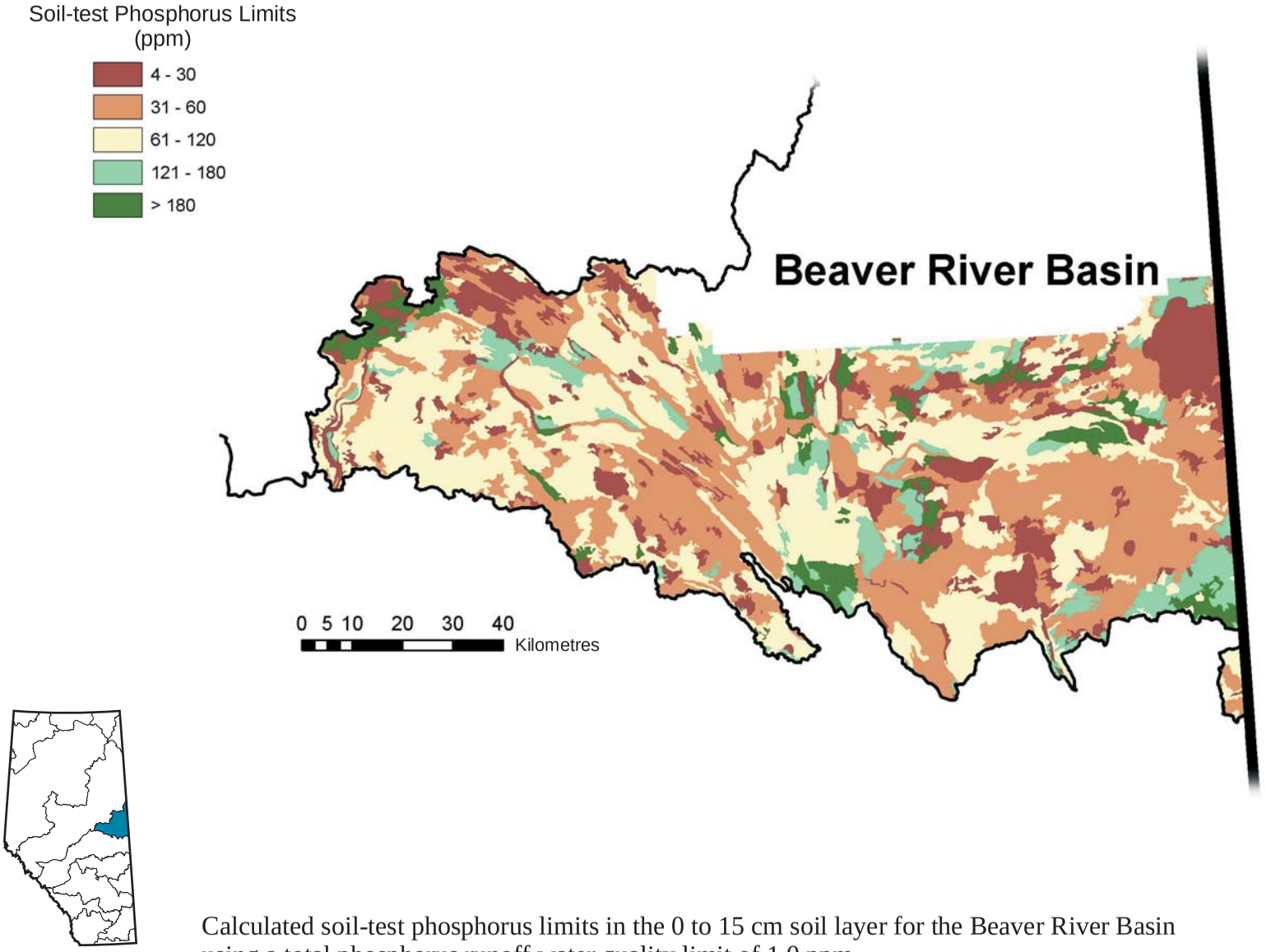

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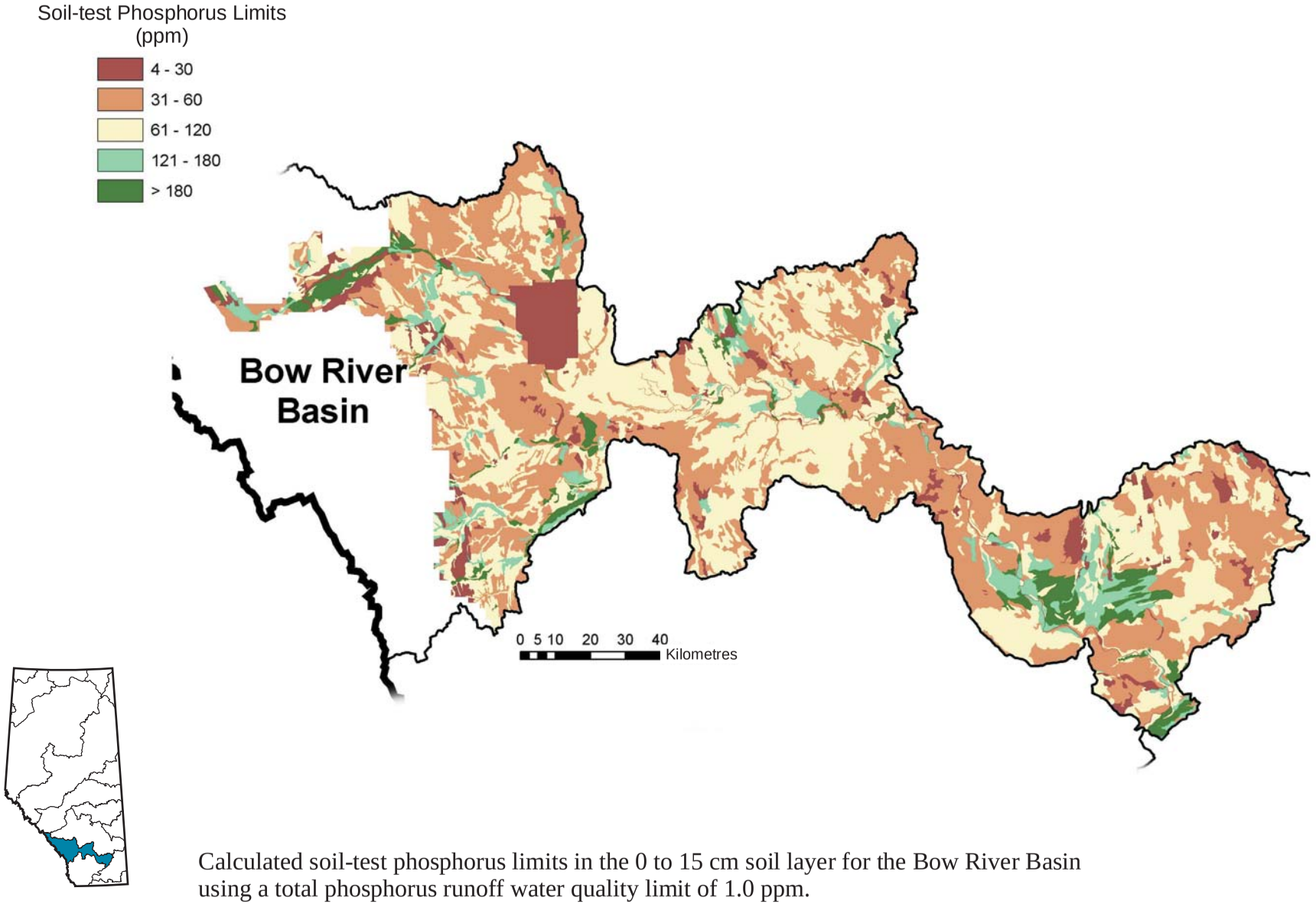

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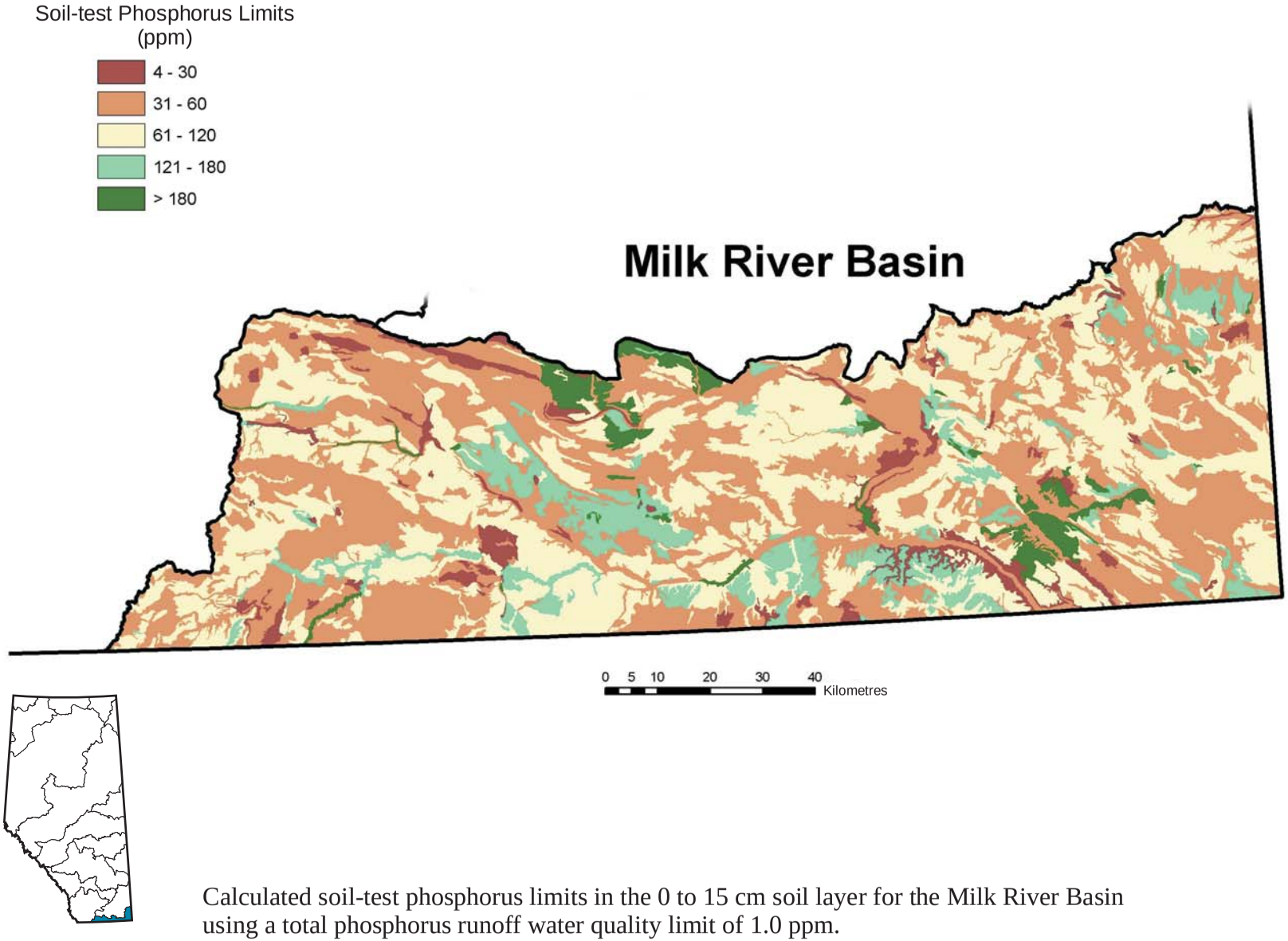
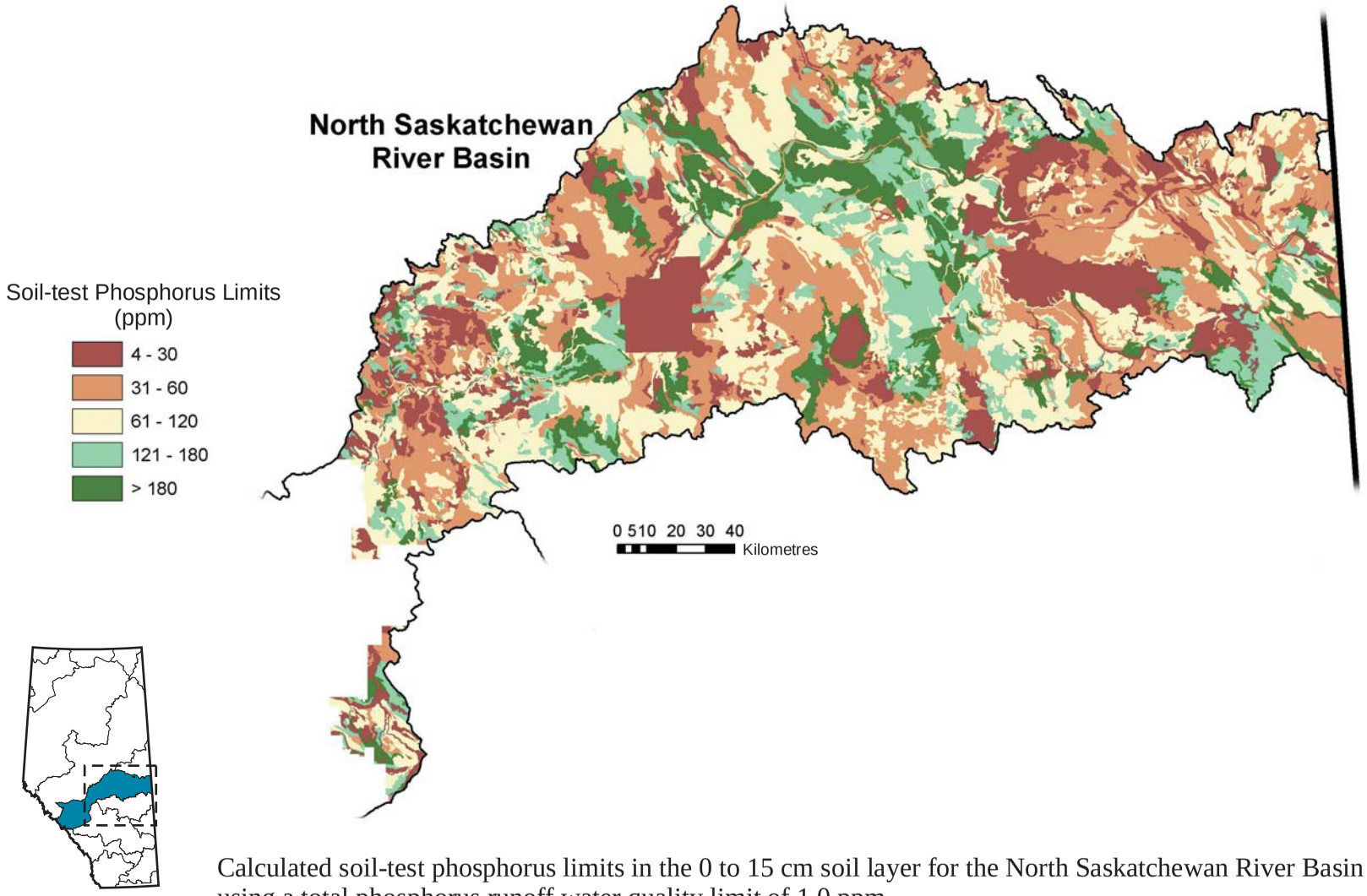
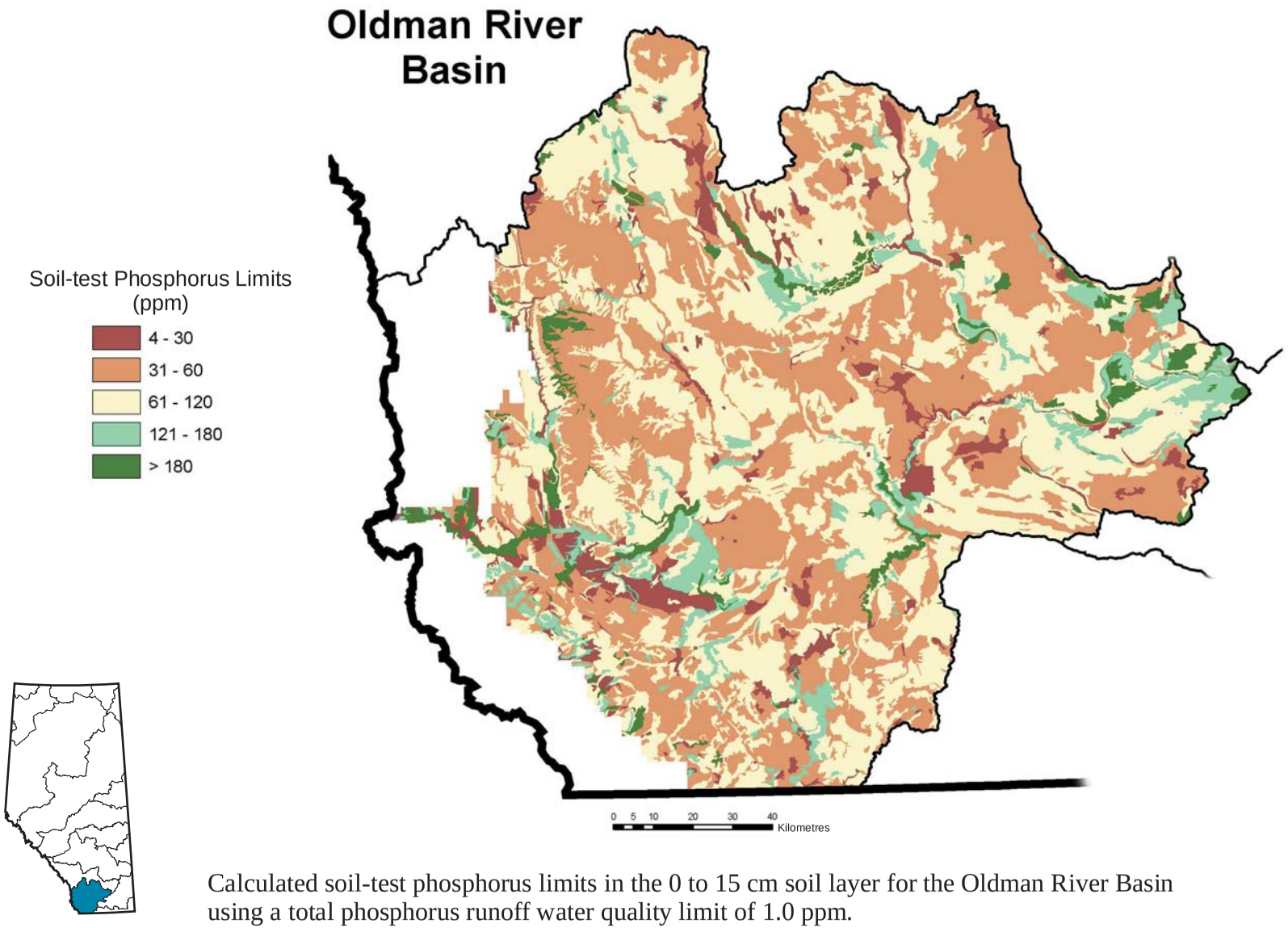


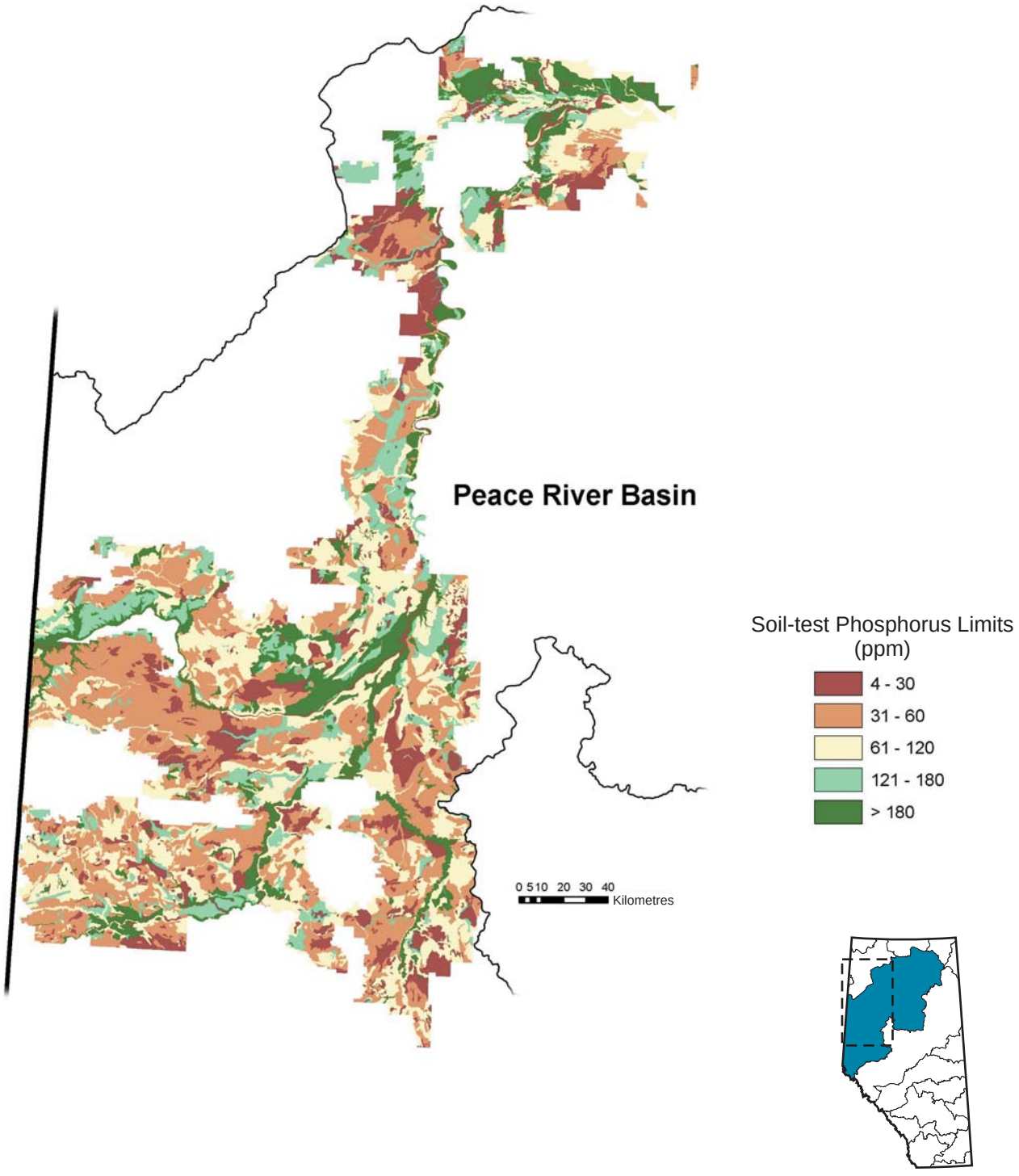
Calculated soil-test phosphorus limits in the 0 to 15 cm soil layer for the Milk River Basin using a total phosphorus runoff water quality limit of 1.0 ppm.



Calculated soil-test phosphorus limits in the 0 to 15 cm soil layer for the North Saskatchewan River Basin using a total phosphorus runoff water quality limit of 1.0 ppm.



Calculated soil-test phosphorus limits in the 0 to 15 cm soil layer for the Oldman River Basin using a total phosphorus runoff water quality limit of 1.0 ppm.



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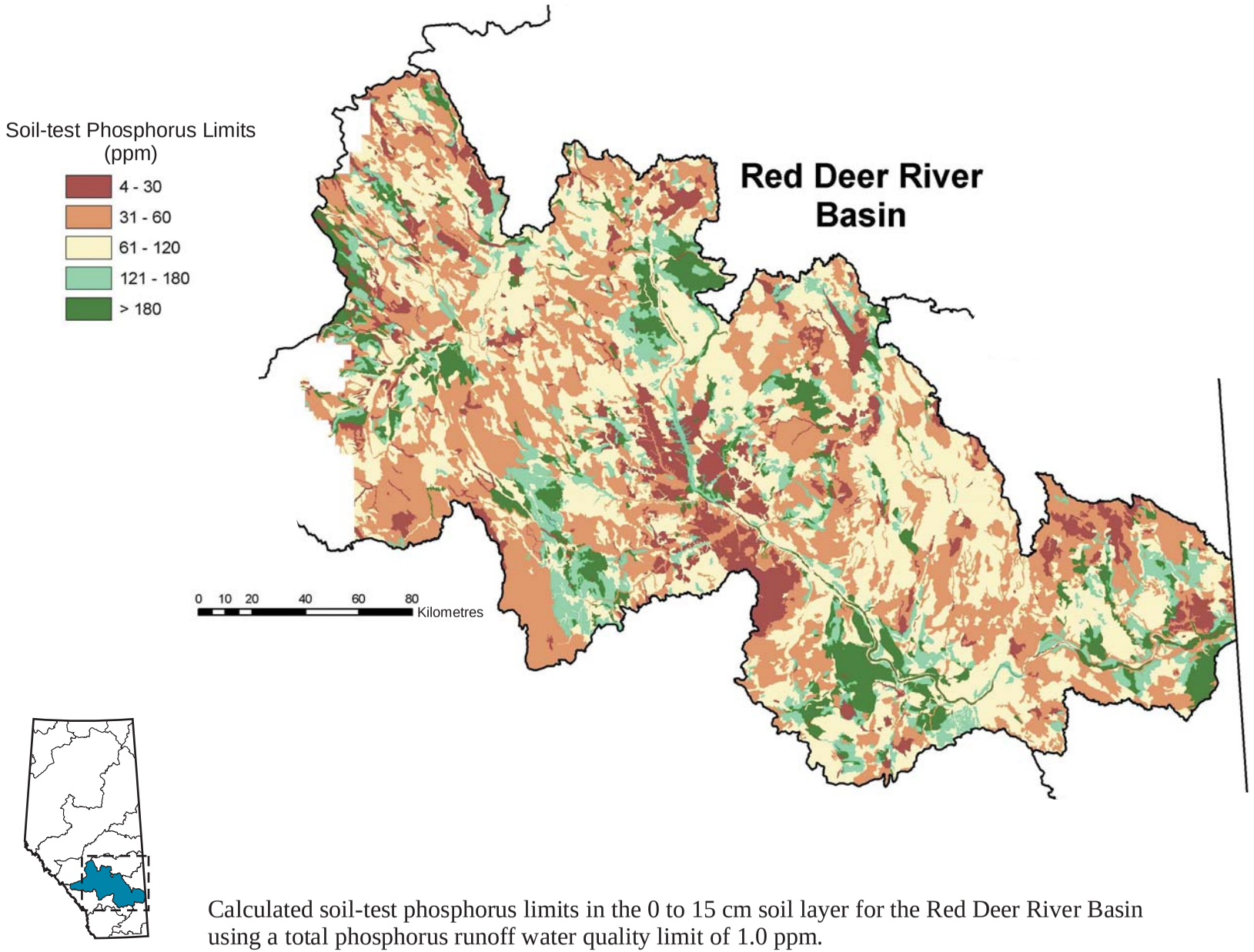

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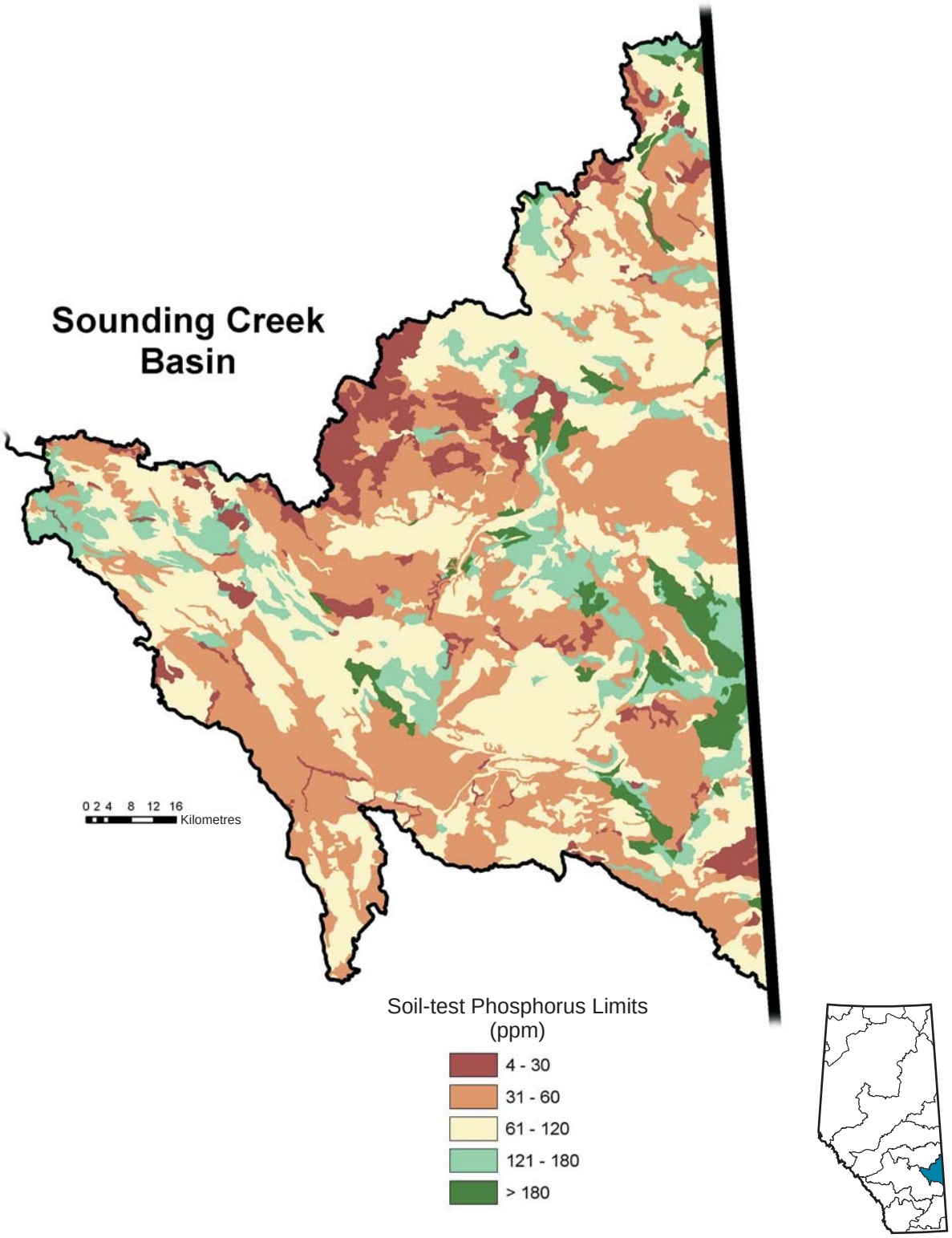
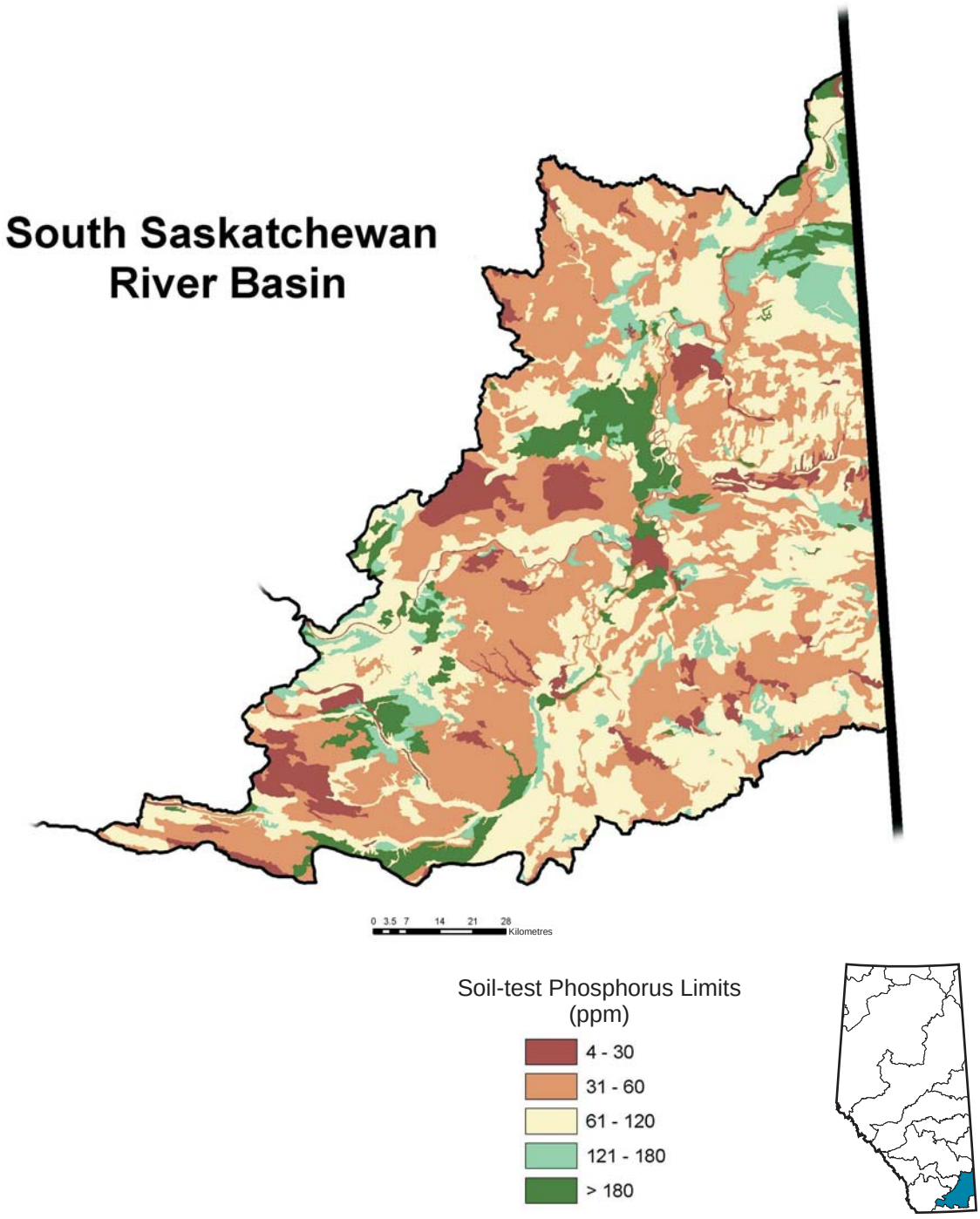


Calculated soil-test phosphorus limits in the 0 to 15 cm soil layer for the Sounding Creek Basin using a total phosphorus runoff water quality limit of 1.0 ppm.



Calculated soil-test phosphorus limits in the 0 to 15 cm soil layer for the South Saskatchewan River Basin using a total phosphorus runoff water quality limit of 1.0 ppm.

Appendix 2. Acronyms used in this volume.

AGRASID	Agricultural Region of Alberta Soil Inventory Database
AOPA	Agricultural Operation Practices Act
BMP	beneficial management practices
$CaCl_2$-P	calcium chloride extractable phosphorus
CAESA	Canada-Alberta Environmentally Sustainable Agriculture
CFO	confined feeding operation
DP	dissolved phosphorus
DPS	degree of phosphorus saturation
DRP	dissolved reactive phosphorus
FWMC	flow-weighted mean concentration
LRSAG	Livestock Regulations Stakeholder Advisory Group
PP	particulate phosphorus
PSC	phosphorus sorption capacity
PSI	phosphorus sorption index
STP	soil-test phosphorus
TP	total phosphorus
TPRWQO	total phosphorus runoff water quality objective
TSS	total suspended solids
WEP	water-extractable phosphorus

Appendix 3. Glossary

Baseflow. Stream discharge or flow composed of groundwater drainage and delayed surface drainage. Baseflow is typically characterized as that portion of stream flow not related to precipitation-induced runoff.

Beneficial management practice. A management practices that have been determined to be the most effective and practical in terms of production efficiency, environmental protection, and social acceptance.

Biosolids. Treated sludge or sewage sludge from municipal sewage treatment facilities. It is a slurry of solids and dissolved solids often used as fertilizer.

Crop phosphorus removal. Is the total phosphorus removed from a field in the harvested portion of the crop.

Crop phosphorus requirement. Is the amount of added phosphorus a crop requires based on soil testing and fertilizer recommendations.

Dissolved phosphorus. Often referred to as total dissolved phosphorus (TDP). After filtration through a 0.45 μm (micrometres) filter, the total phosphorus in the filtrate is measured, usually first by digesting a sample of the filtrate. This will include dissolved inorganic and organic phosphorus. The phosphorus fractions that passes through the filter are assumed to be dissolved and the fractions that do not pass through are in particulate form.

Dissolved reactive phosphorus. The fraction of phosphorus that reacts with molybdenum-blue colorimetric reaction after a water sample has been past through a 0.45 μm filter.

Eutrophication. Is the process whereby water bodies receive excess nutrients that stimulate excessive plant growth. This enhanced plant growth, often called an algal bloom, reduces dissolved oxygen in the water when dead plant material decomposes and can cause other organisms to die.

Flow-weighted mean concentration. Flow-weighted mean concentration (FWMC) is calculated by dividing the total mass or load of a pollutant by the total flow for a given time period. The FWMC is mass normalized for flow.

Load. Is the total amount or mass of a water quality variable passing through a stream during a given time period, often seasonally or annually. A load reflects the combined contributions of surface runoff and groundwater discharge from a specific watershed, as measured at a monitoring station.

Sorption. The removal of an ion or molecule from solution by adsorption or absorption on to or in to particulate material. It is often used when the exact nature of the mechanism of removal is not known.

Soil-test phosphorus. The portion of soil phosphorus that is readily available for plant uptake and is determined by extracting a soil sample with a aqueous extraction solution at room temperature. Also referred to as plant available or mineral phosphorus.

Watershed. The land area that contributes surface water drainage to a stream. The watershed of a larger stream or river may encompass a number of smaller tributary subwatersheds.

UNIT CONVERSIONS

Metric to Imperial

Area:

1 hectare (ha)	=	2.471 acres (ac)
1 square kilometre (km^2)	=	0.3861 square miles (mi^2)

Length:

1 kilometre (km)	=	0.6214 miles (mi)
1 metre (m)	=	1.094 yards (yd)
1 metre (m)	=	3.281 feet (ft)
1 millimetre (mm)	=	0.0394 inches (in)

Volume:

1 litre (L)	=	0.220 imperial gallons (gal)
1 cubic metre (m^3)	=	1.308 cubic yards (yd^3)

Weight:

1 kilogram (kg)	=	2.2046 pounds (lb)
1 megagram (Mg)	=	1.1023 tons (tn)

Rate or yield:

1 kilogram per hectare (kg/ha)	=	0.8922 pounds per acre (lb/ac)
1 megagram per hectare (Mg/ha)	=	0.4461 tons per acre (tn/ac)

Metric to Metric

1 hectare (ha)	=	10,000 square metres (m^2)
1 kilometre (km)	=	1000 metres (m)
1 metre (m)	=	100 centimetres (cm)
1 metre (m)	=	1,000 millimetres (mm)
1 litre (L)	=	1000 millilitres (mL)
1 megagram (Mg)	=	1 tonne (t)
1 megagram (Mg)	=	1000 kilograms (kg)
1 kilogram (kg)	=	1000 grams (g)
1 gram (g)	=	1000 milligrams (mg)

Concentration

milligrams per kilogram (mg/kg)	=	parts per million (ppm)
milligrams per litre (mg/L)	=	parts per million (ppm)

Unit Expressions

kg/ha is the same as kg ha^{-1}

mg/kg is the same as mg kg^{-1}

mg/L is the same as mg L^{-1}