

Riparian Setback Matrix Model



Jay S. White, M.Sc., P.Biol.
Urban Lakes and Wetlands Workshop
Aquality Environmental Consulting Ltd.
September 30, 2011

Presentation Outline

1. Why are we here?
2. Background information
3. Riparian areas – function and importance
4. RSMM Development
5. How to use the model – an example
6. Developer's Guide
7. Decision points

Why are we here?

- Counties currently face the following:
 - land use planning
 - development of new MDPs, IDPs, LUBs...
- These present many challenges for County administration
- Council will need to make many decisions around taking Environmental Reserve (ER)
- Taking of Environmental Reserve often challenged



Aquality

ER: Why do we take it?

- Legislated under the *Municipal Government Act*
- Protection of waterbodies (**Pollution Prevention**)
- Prevent development in dangerous areas
- Allow Public Access
- Owned by the Municipality

....but

- Loss of tax revenue
- Maintained by the Municipality
- Legal liability issues

RSMM Benefits

- Municipalities will protect source water (drinking water sources) and ultimately save thousands of dollars on long term water treatment costs
- The model will aid in the protection of shorelines, water quality and riparian areas, while allowing for development to occur in a sustainable manner
- The RSMM has been established as policy in Lac La Biche County and in the MD of Rockyview's Riparian Area Policy and Wetland Policy documents

What are Municipalities doing?

- In light of the gaps in existing legislation, many municipalities facing development pressure have taken the responsibility of developing their own methods for preserving environmentally sensitive areas (MGA)
- Across the province we are seeing Riparian and Wetland Policies being written by municipalities to circumvent the loss of important areas
- Implementation of these policies often requires the development of innovative tools that are legally and scientifically defensible
- **No time to wait for the Province to catch up! The pace of development is simply too fast**

Model Development Background

- Lac La Biche County – facing tremendous development pressures
- Looking for a way to preserve riparian areas and water quality in the numerous lakes in the region
- Other municipalities have included arbitrary setback distances in their land use bylaws/MDP's /ASP's – “one size fits all” approach
- Lac Ste. Anne – 30 m arbitrary buffer
- Wizard Lake ASP – 250 m buffer
- Lac La Biche County was also rewriting their MDP to support their Lakeshore Policy Area and Environmental Reserve Environment Policy, as well as writing a specialized ASP for one particular Environmentally Sensitive Area (Red Deer Brook)



Aquality

Background cont'd...

- Lac La Biche County asked Aquality to develop a model for creating unique, defensible riparian development setbacks to prevent **pollution** based on current scientific knowledge
 - Took 3 years to develop
- The model addresses the fact that all water bodies are not created equal, and that setback distances may be varied depending on the individual conditions
- The model can also be used to determine appropriate development setbacks and land uses for all private lands located adjacent to environmentally sensitive and/or significant lands within a municipality



Aquality

**Upland
(Forested)**

**Upland
(Cleared)**

Floodplain

Bank

Bank

**Active Channel
or Basin Width**

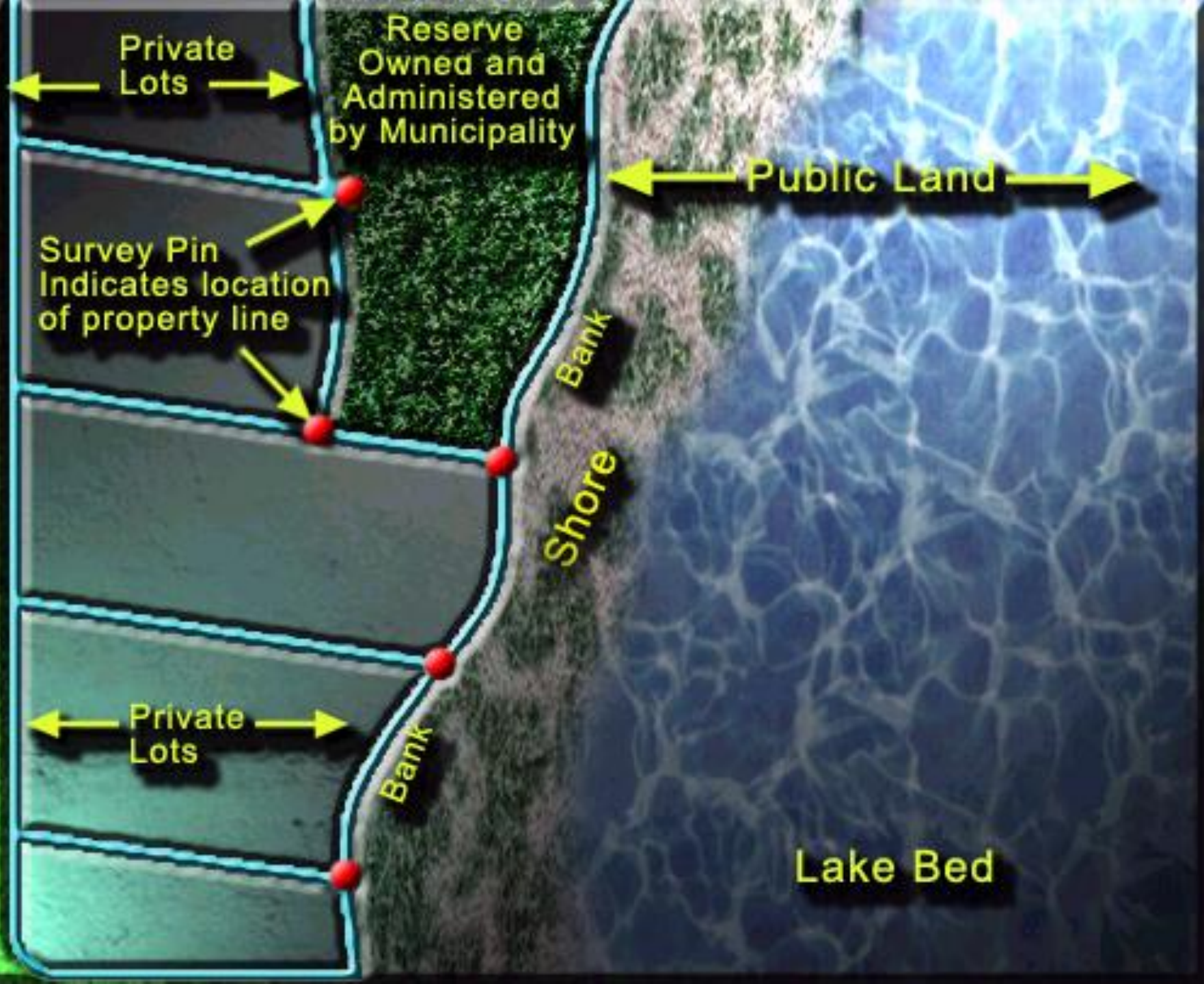
FISHERIES ACT

**NAVIGABLE WATERS
PROTECTION ACT**

PUBLIC LANDS ACT

WATER ACT

**ENVIRONMENTAL PROTECTION
AND ENHANCEMENT ACT**

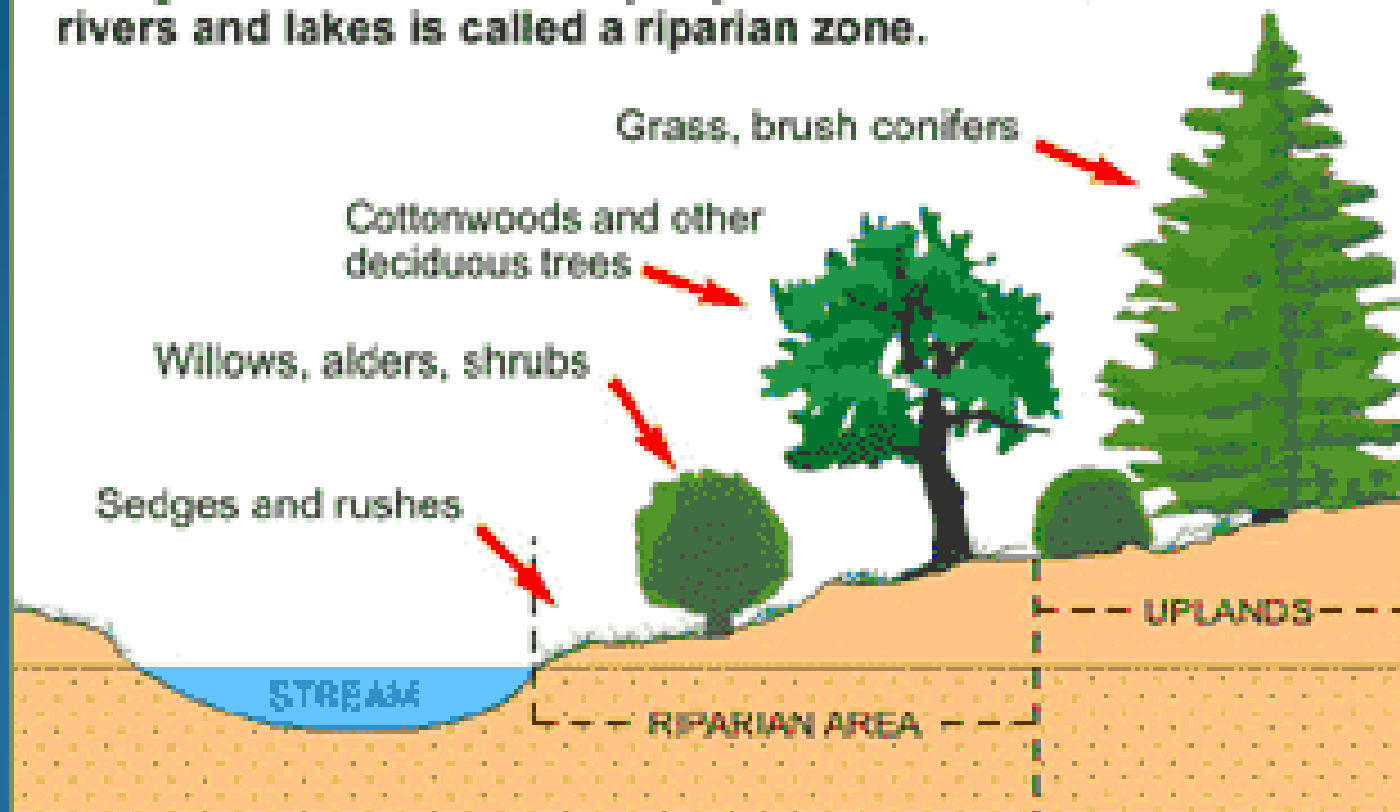


Riparian Areas – Function and Importance

- Riparian areas – located around the perimeter of lakes, rivers, wetlands
- Include emergent and upland vegetation
- Remove excess nutrients and sediment from surface runoff and subsurface flow, preserving water quality
- Prevent erosion, attenuate flood waters and provide vital wildlife habitat



The green area immediately adjacent to streams, rivers and lakes is called a riparian zone.



AQUALITY



What do Riparian Areas Do?

Key Ecological Functions



1. Trap & Store Sediment

- Sediment adds to and builds soil in riparian areas.
- Sediment aids in the ability of soils to hold and store moisture.
- Sediment can carry contaminants and nutrients - trapping it improves water quality.
- Excess sediment can harm aquatic animals like fish and insects.



2. Build & Maintain Banks & Shorelines

- Erosion is balanced with bank building - the effects of erosion are reduced by adding bank and shore elsewhere.
- Increase stability, resilience and recovery.
- Maintain or restore profile of channel - extends width of riparian area through higher water tables.



3. Store Water & Energy

- Watershed safety valve - storage of high water on the floodplain during floods.
- Reduce flood damage by slowing water and reducing erosion.
- Slow flood water allowing absorption and storage in underground aquifer.



4. Recharge Aquifers

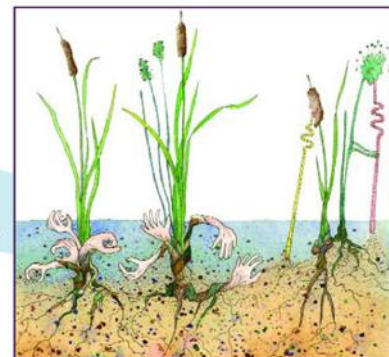
- Store, hold and slowly release water.
- Maintain surface flows in rivers and streams and levels in lakes and wetlands through storage and slow release.
- Maintain high water table and extend width of productive riparian area.



5. Filter & Buffer Water



- Reduce amount of contaminants, nutrients and pathogens reaching the water.
- Uptake and absorption of nutrients by riparian plants.
- Trap sediment, reduce water quality issues and enhance amount of vegetation to perform filtering and buffering function.



6. Reduce & Dissipate Energy



- Reduce water velocity, which slows erosion and sediment transport.
- Resist erosion and slow channel and shoreline movement.
- Aid in sediment capture.

7. Maintain Biodiversity



- Create and maintain habitats for fish, wildlife, invertebrates and plants.
- Connect other habitats to allow corridors for movement and dispersal.
- Maintain a high number of individuals and species.



8. Create Primary Productivity



- Vegetation diversity and age-class structure creates links to other riparian functions.
- High shelter and forage values.
- Enhance soil development.
- Capture and recycle nutrients.

These are the basic functions; read on to see how they translate into products, services and benefits.

Model Development

- Most important factors to consider when preserving a healthy riparian ecosystem were chosen:
 - Vegetation type and density
 - Slope
 - Groundwater influence
 - Bank Height
 - Soil type

Minimum setback distance set at 6 meters –required under MGA (Provincial Legislation)

Model Development cont'd...

- Parameters such as nutrients (TN and TP), sediments and bacteria were considered as they have the largest impact on water quality and fish habitat
- Removal rates of these parameters by soils and vegetation researched in scientific literature
- Groundwater research was limited in this area
- A table was created as a “double check” for the matrix – presents recommended riparian development setback distances for effective nutrient and sediment attenuation
- Each site must be assessed individually



Aquality

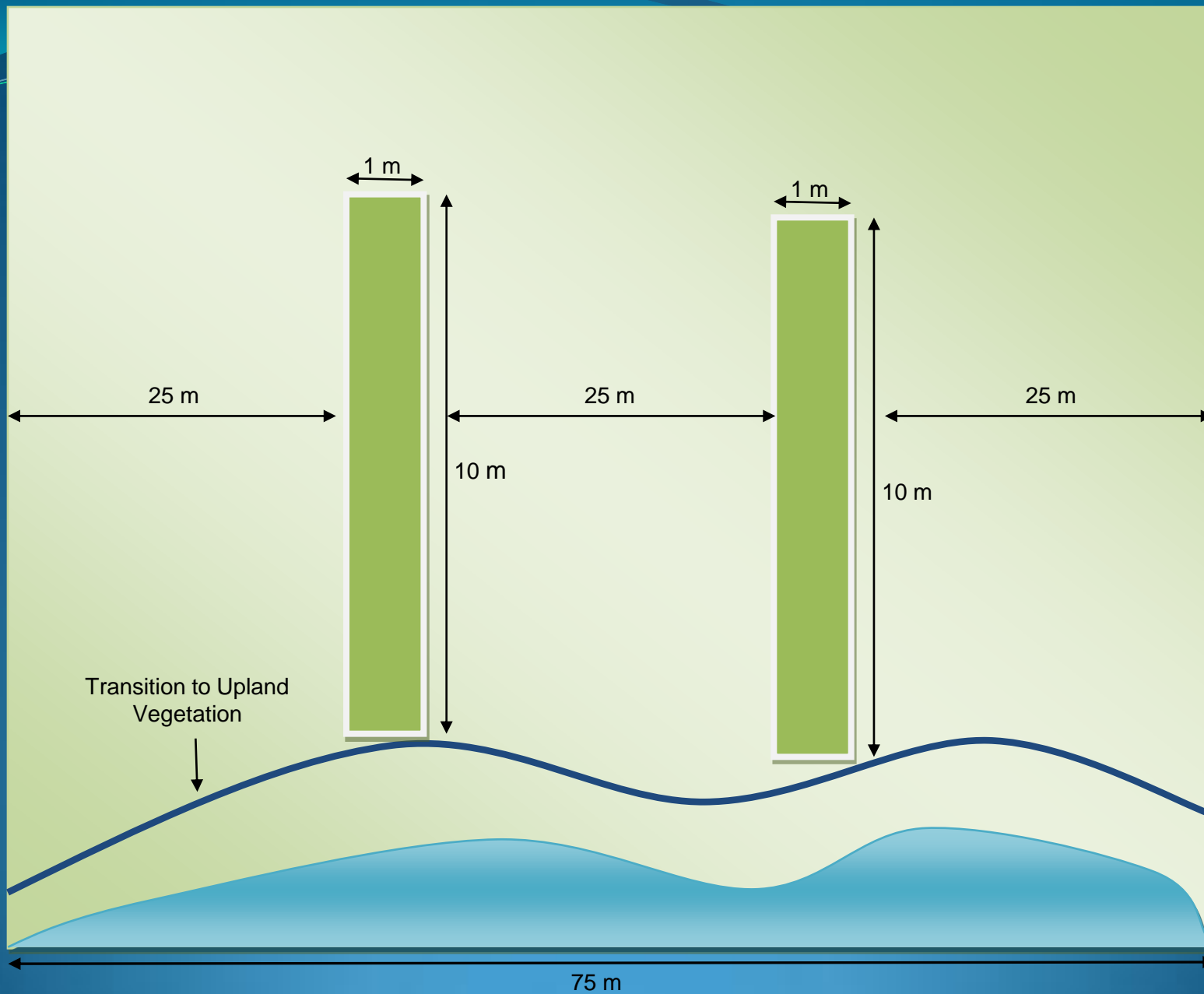
Parameter	Riparian Vegetation	Recommended Setback (m)	Notes
Nitrogen	Grass	50+	-Will remove ~90% of nitrate from surface and subsurface runoff.
	Grass/Shrub or Forest	30+	
	Forest	30+	
Phosphorus	Grass	20+	-Will reduce soluble phosphorus by ~90%. -See recommendations for sediment for the removal of total phosphorus (most phosphorus enters a buffer attached to the sediments).
	Grass/Shrub or Forest	20+	
	Forested	20+	
Sediment	Grass	30+	-Will remove ~90% of sand and silt particles. -100m is required for the effective removal of clay particles. - For long term retention of sediments the setback should be 30 – 100m.
	Grass/Shrub or Forest	30+	
	Forested	25+	

Steps:

1. Establish the number and location of setback points required
2. Determine the slope of the land
3. Determine bank height
4. Determine depth to water table
5. Determine vegetation type
6. Determine soil type

Steps:

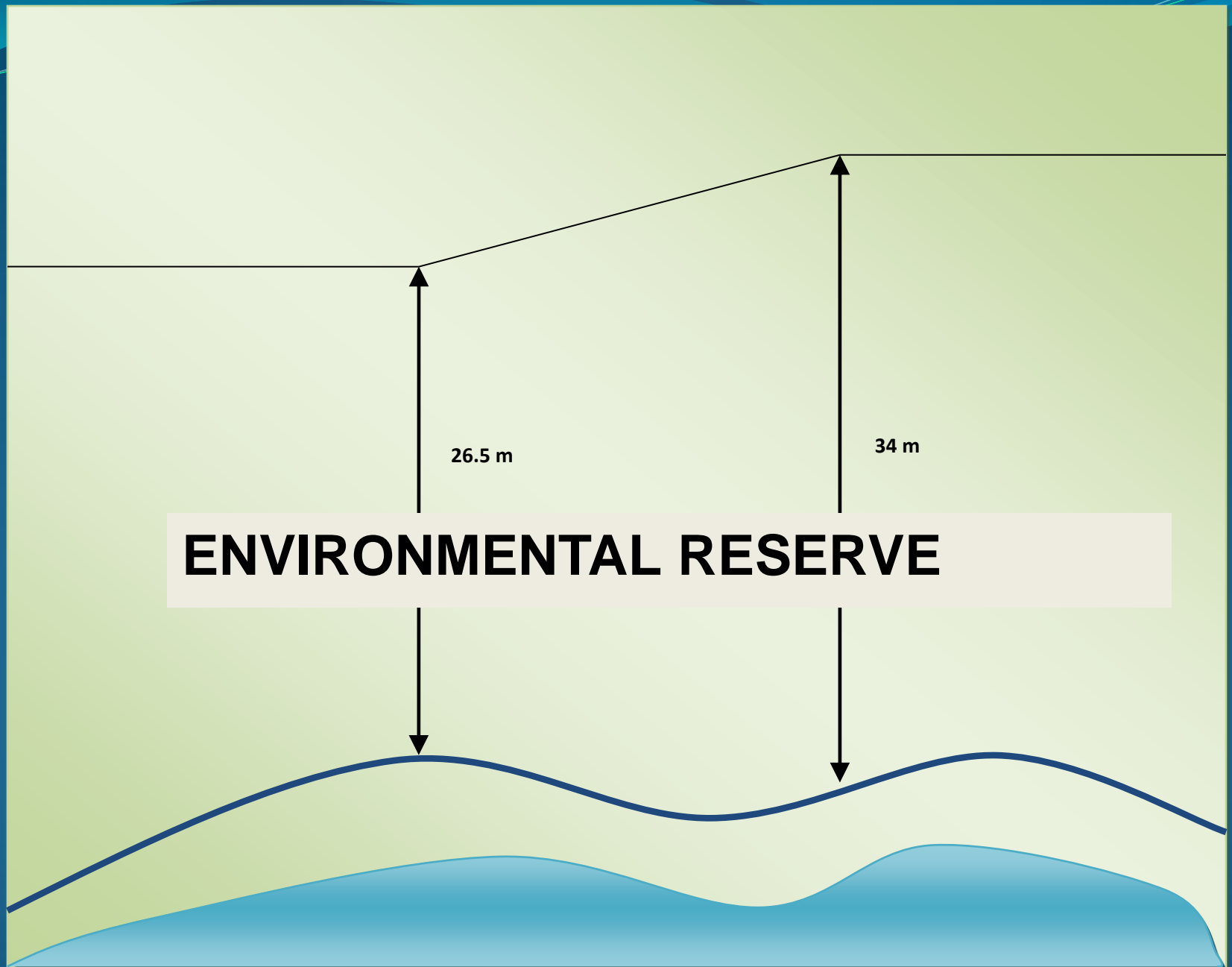
- From the location of setback points previously determined, measure out 1 m x 10 m plots perpendicular to the vegetation transition or waters edge
- Determine the percent cover of each vegetation type in each plot (Grass, Shrub, Forested and Cleared)
- Multiply the distance adjustment of the respective vegetation cover by the % it occupies
- Add together the calculated distance adjustments from each vegetation type. The total is the distance adjustment for that point
- Repeat these steps for each point



Steps cont'd...

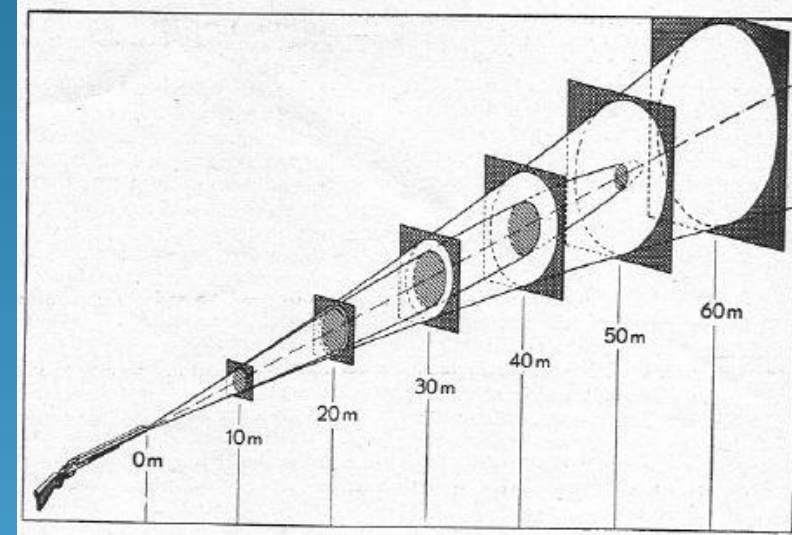
- In Lac La Biche County only, a maximum of 50 m setback distance has been set, so once 50 m distance has been reached on the worksheet the assessment can be stopped
- If 50 m is not reached, the largest number from any step shall be used as the setback amount
- Most sensitive parameter is protected





Council Decisions

- County must decide on spread
 - LLC picked 6 m to 50 m setbacks
 - Rockyview picked 10 m to 50 m setbacks
 - Leduc County 6 m to 30 m
 - What range is most acceptable for use in your County?
- This is a Council Policy decision!



Developer's Guide

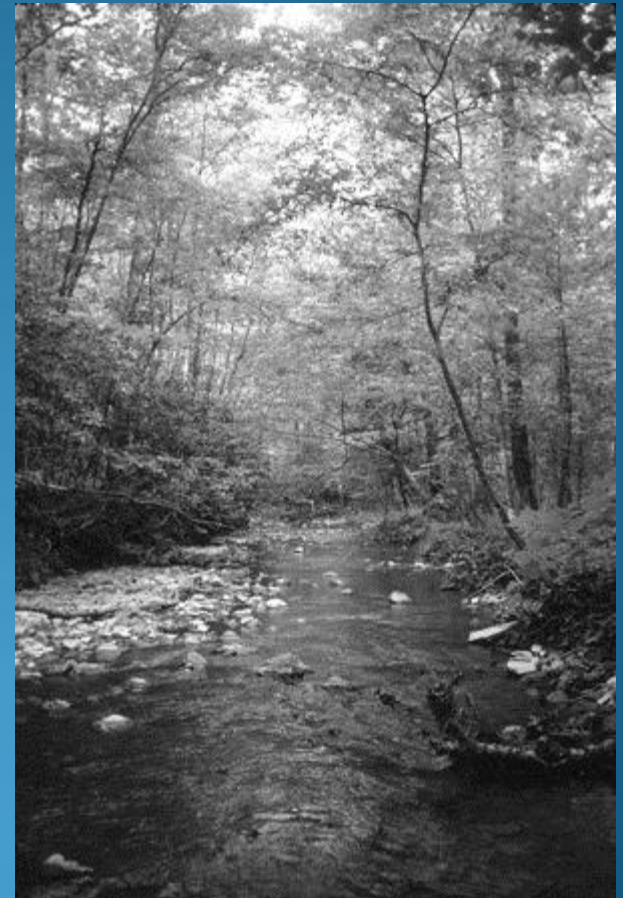
- Companion guide to the RSMM
- Written to assist developers with the application of the RSMM
- Specifies who is qualified to complete the site assessment
 - must be a qualified professional, registered in Alberta (i.e. surveyor, engineer, hydrologist, biologist, etc.)
 - Council will need to identify qualified professionals

Model Flexibility

- Can be adapted to prevent pollution of a variety of parameters (pesticides, viruses, bacteria, etc.)
- Can be adapted to suit protection of wildlife habitat or corridors; nesting areas, etc. – does not have to be limited to pollution prevention
- Can be used on rivers with the addition of meander as a parameter
- Suitable for all waterbodies; wetlands, lakes, rivers, creeks

Who could use the RSMM

- Municipalities
- Policy makers
- Developers
- Private landowners
- Government



Provincial Riparian Policy?

- With a new Wetland Policy soon to be in place, a seemingly logical fit would be an accompanying Riparian Area Policy
- Tools such as the RSMM could be incorporated into such a policy to assist with determination of appropriate setback widths that are legally defensible
- Recently GoA initiated a project and subsequent report “Stepping Back from the Water: Best Management Practices for conserving riparian areas in Alberta’s settled region”
DRAFT
- Objective is to build a team to review riparian management systems and identify components that could be changed to meet local objectives

Riparian Land Conservation and Management Policy Working group

- Riparian land systems have been recognized as important components of a healthy aquatic ecosystem
- They are among the most productive and valuable of all landscape types
- Quantity and health of riparian lands have declined dramatically since the 1900's
- Many organizations work to promote riparian health (Cows & Fish)

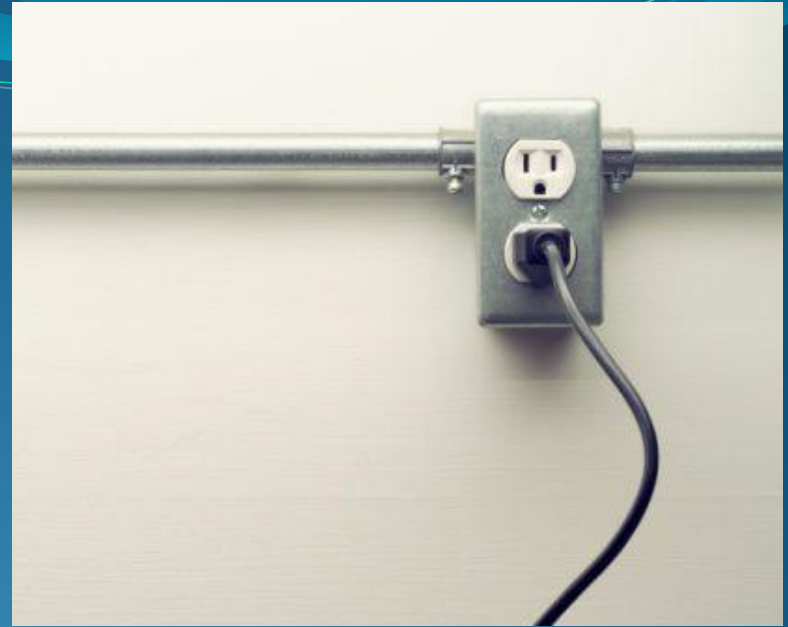
Riparian Land Conservation and Management Policy Working group

- OBJECTIVES:
- 1) Develop a definition for riparian lands
- 2) Document the current state of riparian lands, management, and stewardship in Alberta and the riparian management and stewardship “best practices” (policy, practices and procedures) of other jurisdictions
- 3) Evaluate the current state of riparian lands, management, and stewardship against the needs of all relevant sectors and propose recommendations for improving riparian land conservation and management in Alberta
- Alberta Water Council *Riparian Land Conservation and Management* Terms of Reference (June 2011)

Decision Point

How does this plug in to what
The County is doing?

1. Spread (range)
2. Protection Goals – ESA's, specific parameters (wildlife?)
3. Who is qualified to perform assessment?
4. Soils – include or not?
5. What waterbodies/situations will the model apply?



Thank you!

Questions?

