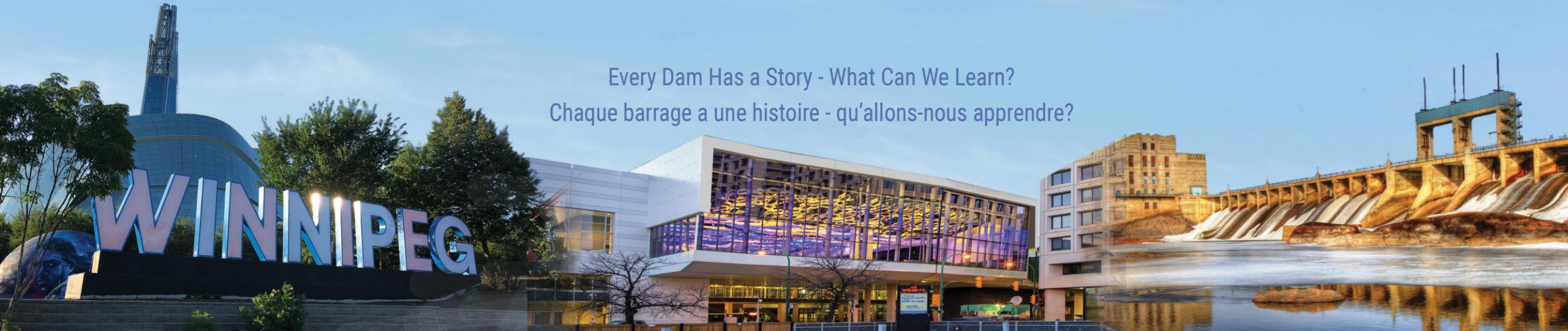


Updating Probable Maximum Precipitation Over A Large and Complex River System in Northern Manitoba

Bill Kappel, Applied Weather Associates

Every Dam Has a Story - What Can We Learn?
Chaque barrage a une histoire - qu'allons-nous apprendre?



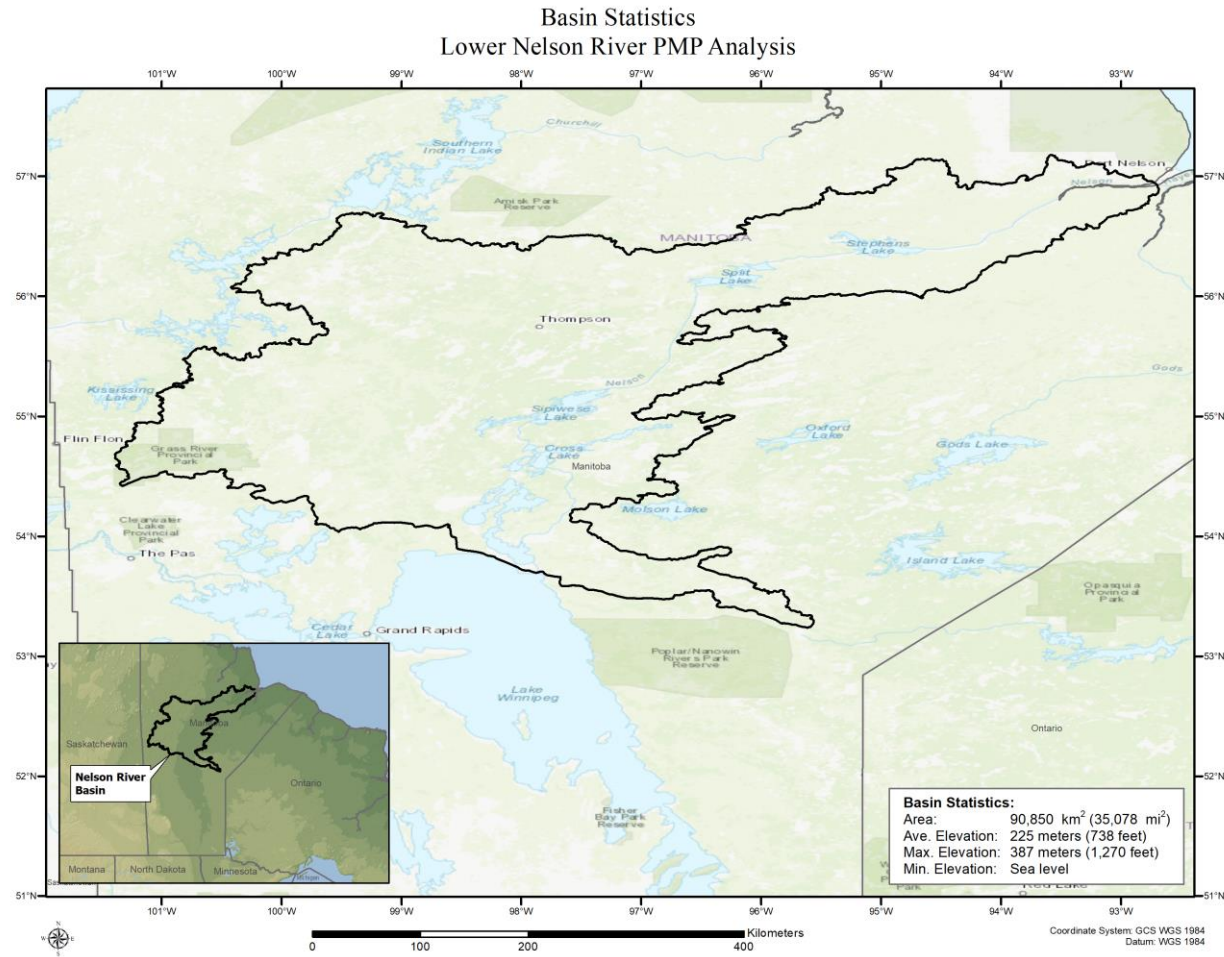


Acknowledgement(s)

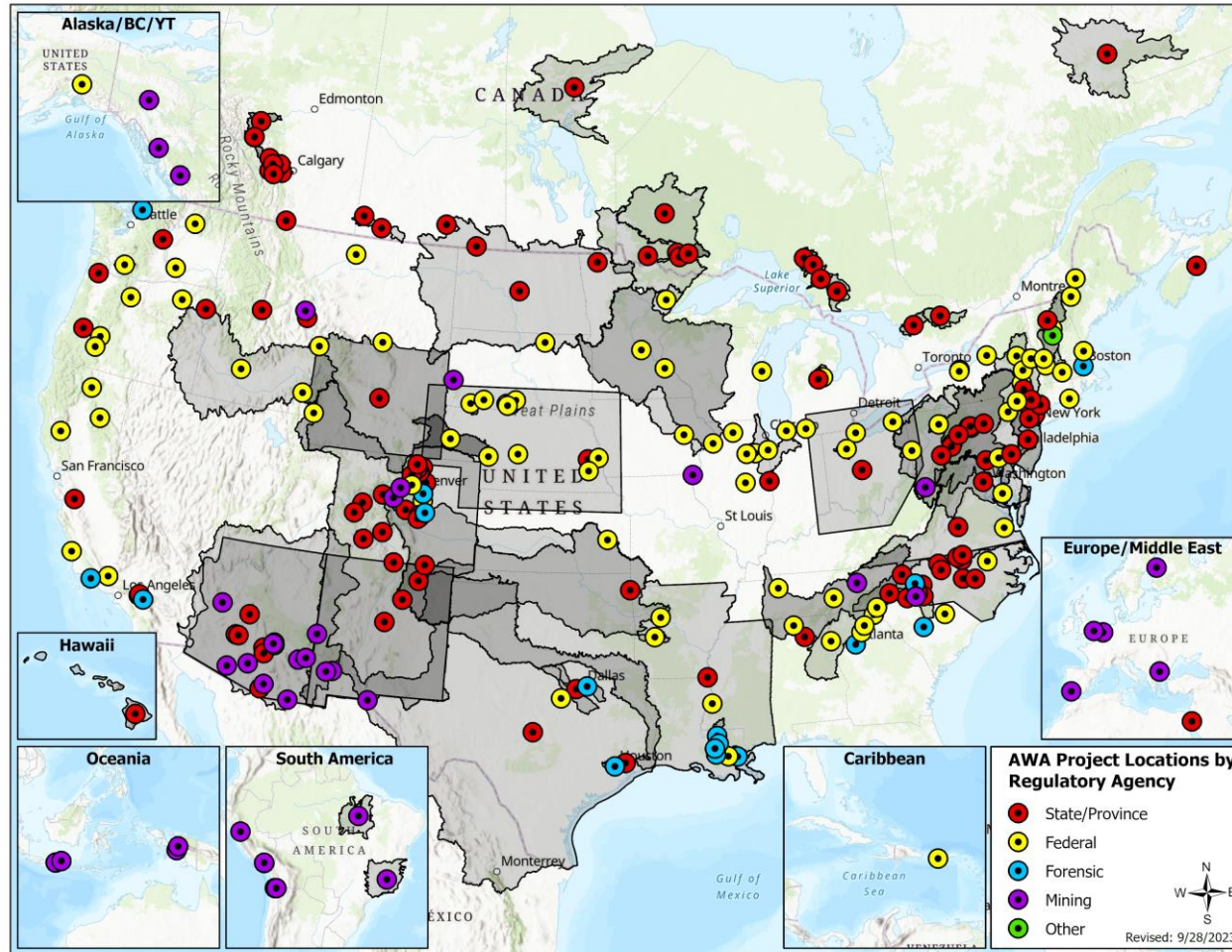
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Basin Location and Description



Previous and Concurrent Studies



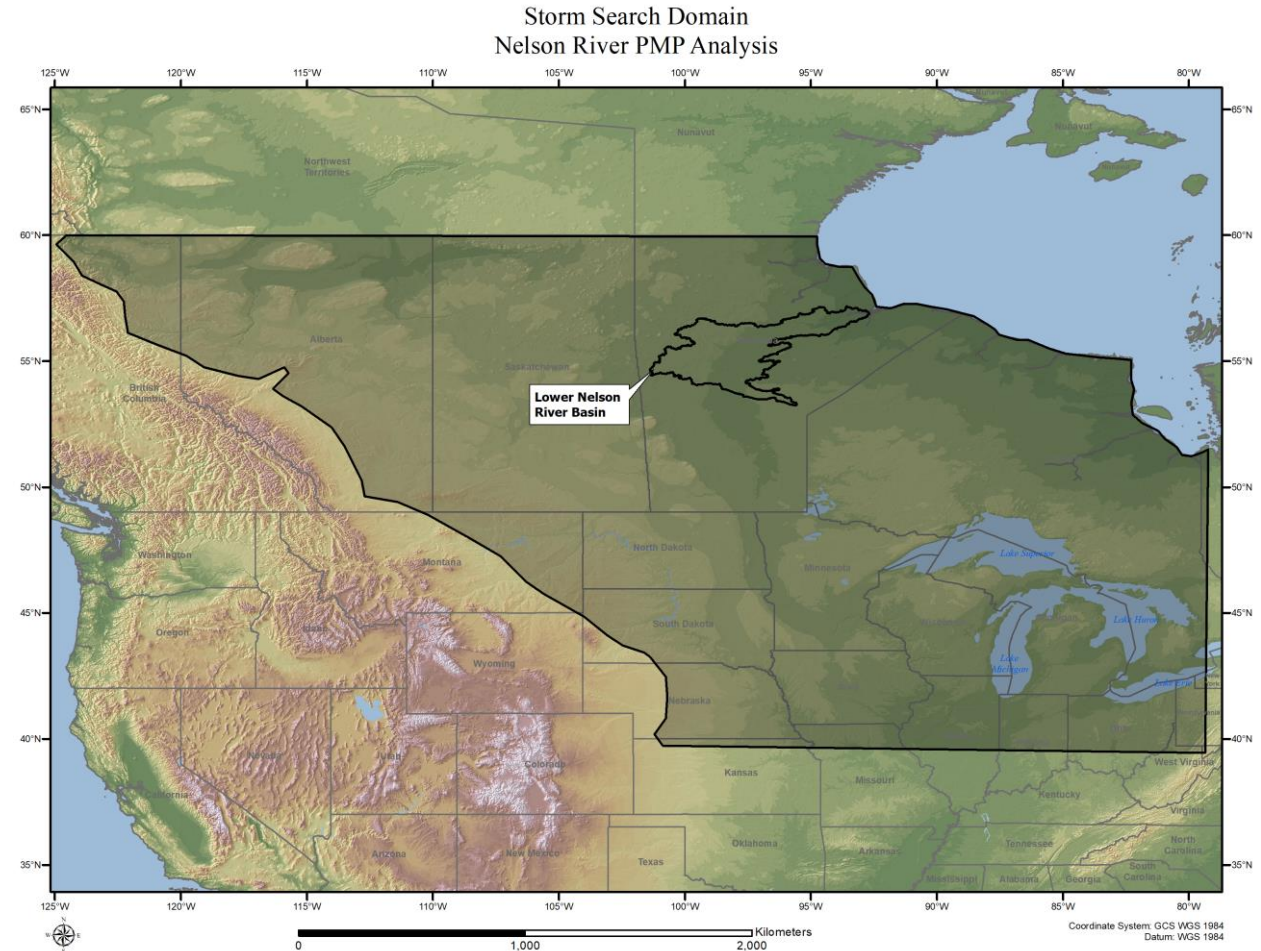
PMP Development Background

- Storm based approach
 - Deterministic values
 - Gridded process applied
 - Based on PMP type storm within the region
 - Both Spring and Summer/Fall seasons
 - Follows CDA, NWS, WMO guidelines



Storm Database Development

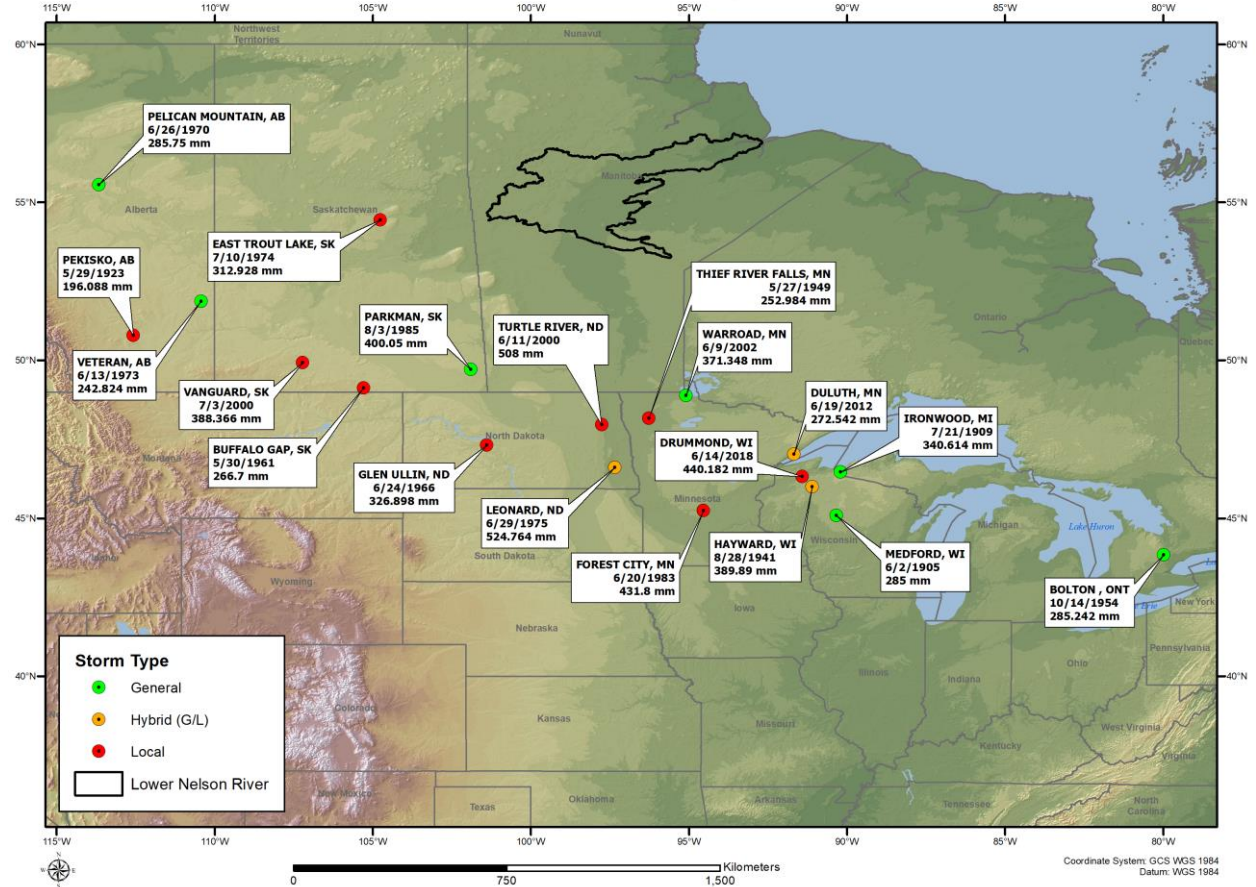
- Identify all potential storms
- Update storm database to current date



Storm Database-Summer-Fall

- Storm coverage includes all storm types
- Large region
 - Trade time for space

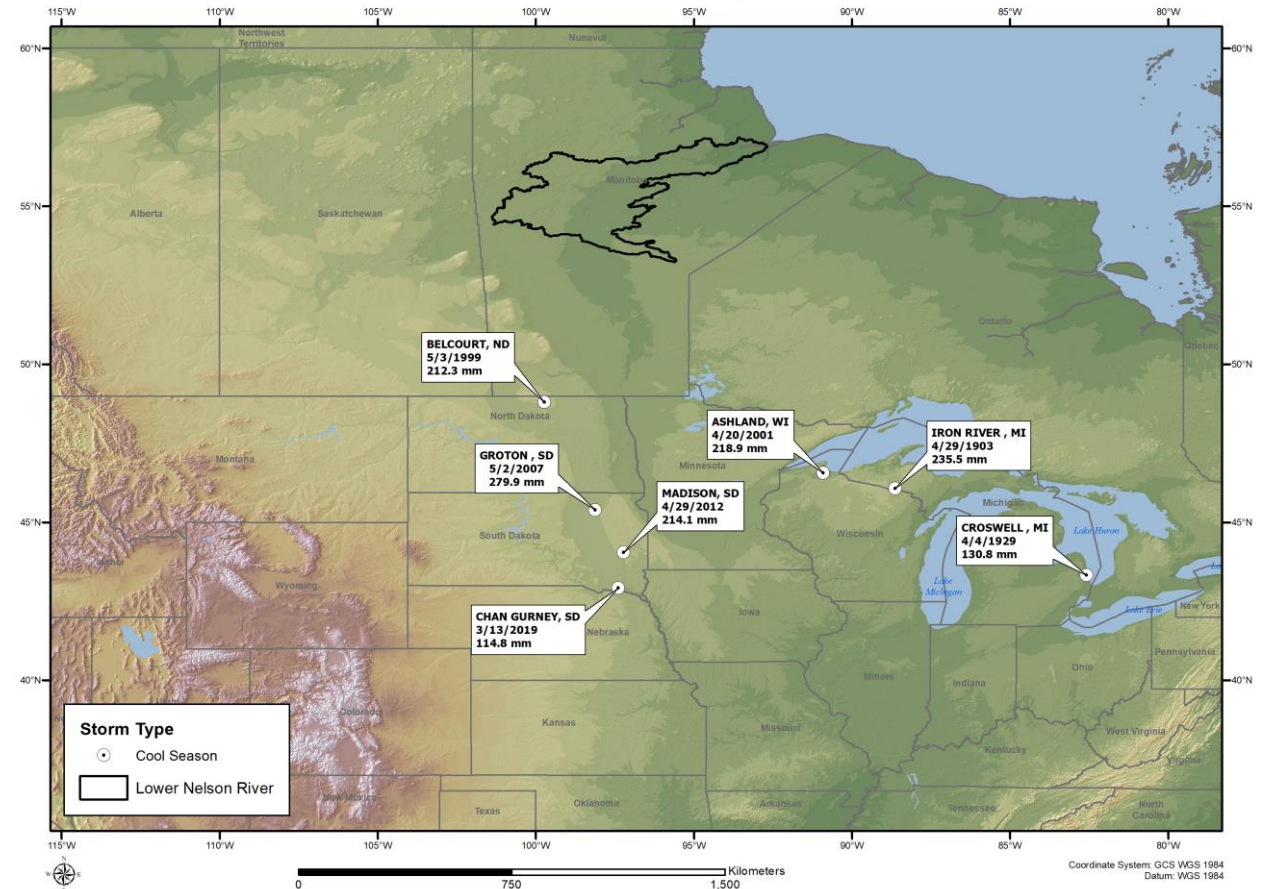
Locations of all Summer Season Storm Events - Short List
Nelson River PMP Analysis



Storm Database-Spring

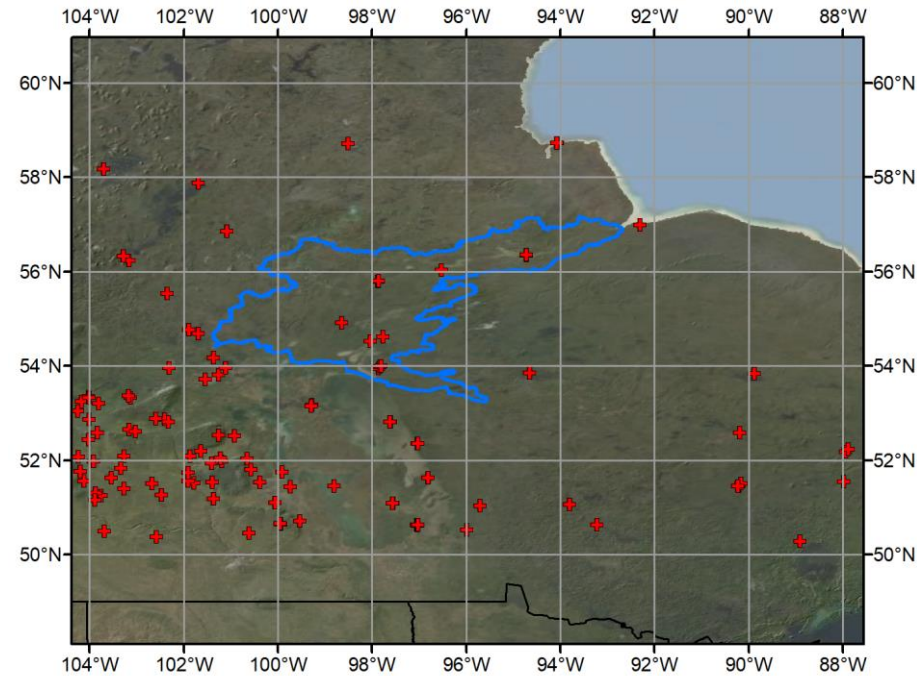
- Storm coverage includes all storm types
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Locations of all Spring Season Storm Events - Short List
Nelson River PMP Analysis



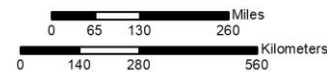
Precipitation Frequency Development

- Plenty of stations
- Good period of record
- Good spatial coverage
- 6-hour and 24-hour
- GEV probability distribution



Nelson River Basin Regional Stations

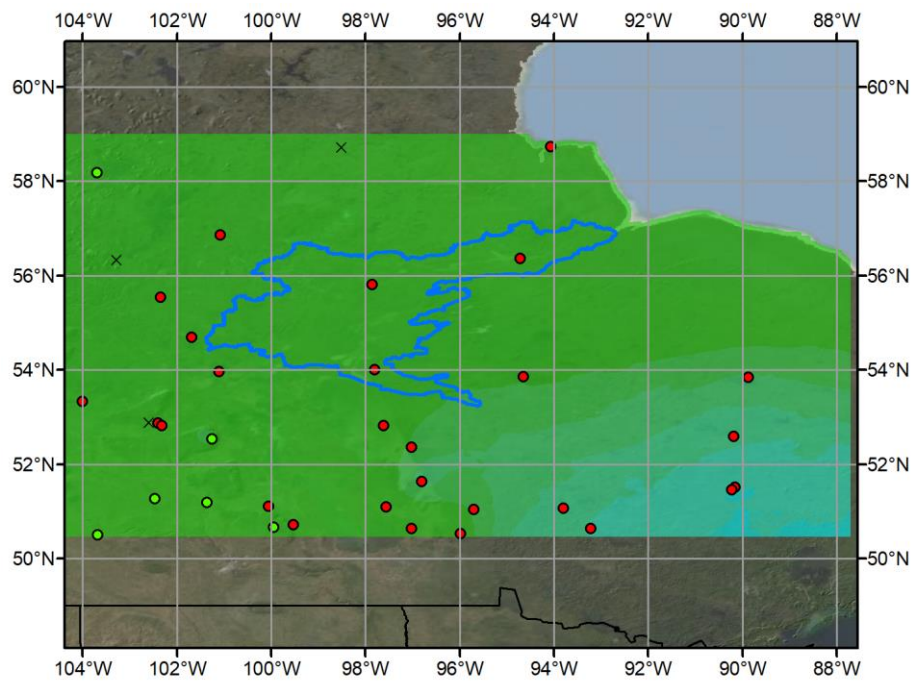
Gauges



11/12/2021



Precipitation Frequency Development

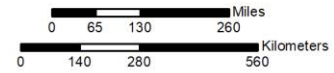
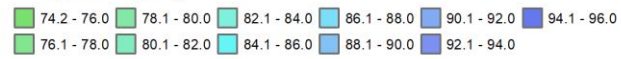


6-hour 100-year Precipitation

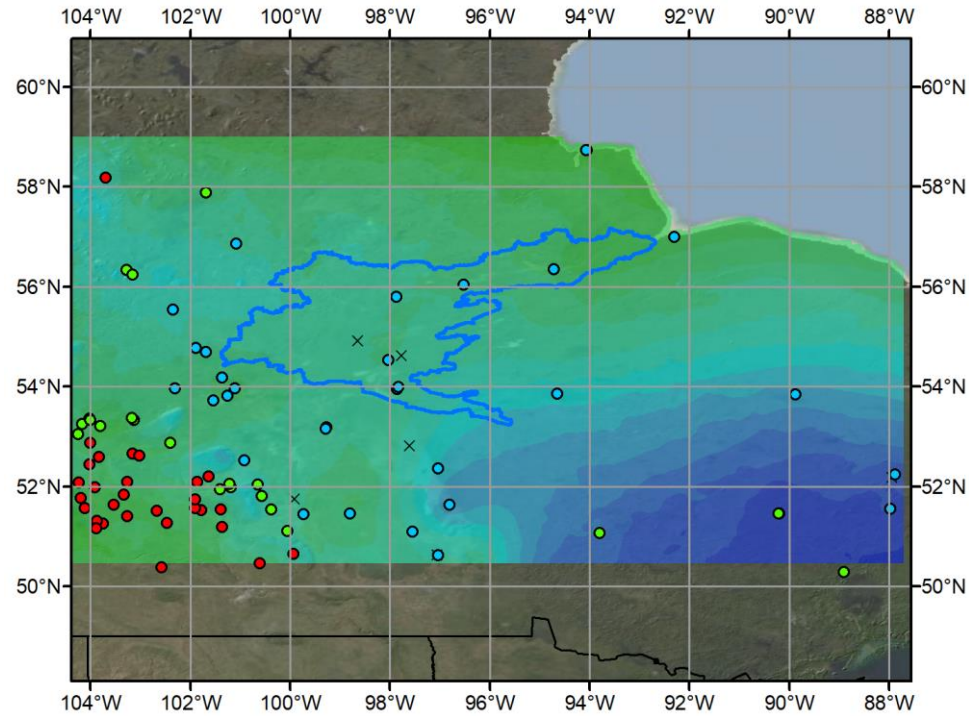
Gauges

- Cluster 1 × Cluster 1 Removed
- Cluster 2

Precipitation (mm)



11/12/2021

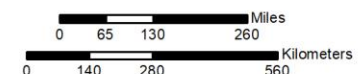
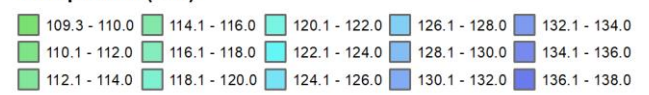


24-hour 100-year Precipitation

Gauges

- Cluster 1 ● Cluster 3
- Cluster 2 × Cluster 3 Removed

Precipitation (mm)



11/12/2021



Example Results

- Various controlling storms

General Storm 90,850 km ² Basin Average PMP						
Hour	1	6	12	24	48	72
PMP (mm)	15.1	60.0	90.5	139.1	169.4	180.0
PMP (in)	0.6	2.4	3.6	5.5	6.7	7.1
Controlling Storm	SPAS 1502_1 Verteran, AB	SPAS 1502_1 Verteran, AB	SPAS 1504_1 Pelican Mountain, AB	SPAS 1502_1 Verteran, AB	SPAS 1502_1 Verteran, AB	SPAS 1504_1 Pelican Mountain, AB

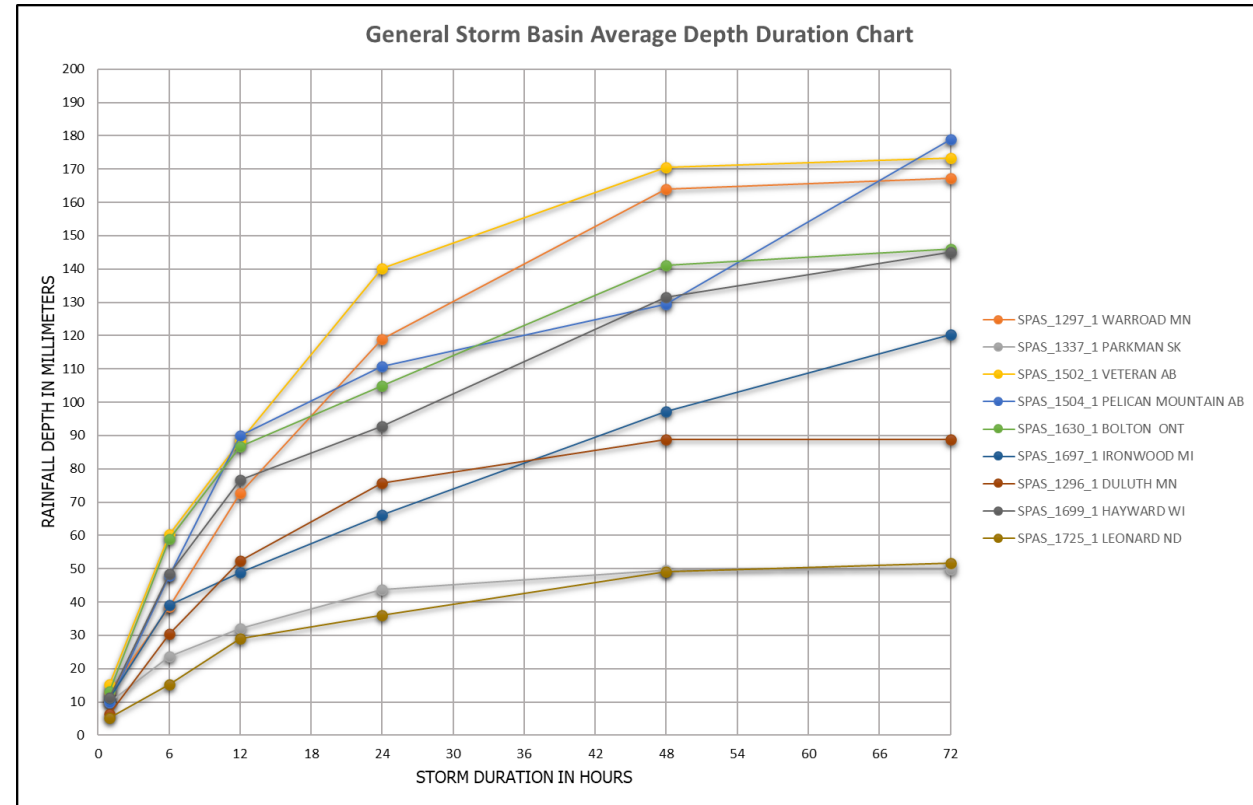
Spring Season Storm 90,850 km ² Basin Average PMP						
Hour	1	6	12	24	48	72
PMP (mm)	8.5	33.3	50.3	71.8	98.1	102.9
PMP (in)	0.3	1.3	2.0	2.8	3.9	4.1
Controlling Storm	SPAS 1740_1 Croswell, MI	SPAS 1737_1 Chan Gurney, SD	SPAS 1737_1 Chan Gurney, SD	SPAS 1733_1 Groton, SD	SPAS 1733_1 Groton, SD	SPAS 1733_1 Groton, SD

Local Storm 90,850 km ² Basin Average PMP									
Hour	1	2	3	4	5	6	12	24	
PMP (mm)	16.6	30.2	41.7	49.5	53.2	55.6	66.1	79.9	
PMP (in)	0.7	1.2	1.6	1.9	2.1	2.2	2.6	3.1	
Controlling Storm	SPAS 1744_1 East Trout Lake, SK	SPAS 1744_1 East Trout Lake, SK	SPAS 1744_1 East Trout Lake, SK	SPAS 1744_1 East Trout Lake, SK	SPAS 1744_1 East Trout Lake, SK	SPAS 1744_1 East Trout Lake, SK	SPAS 1744_1 East Trout Lake, SK	SPAS 1699_1 Hayward, WI	SPAS 1699_1 Hayward, WI



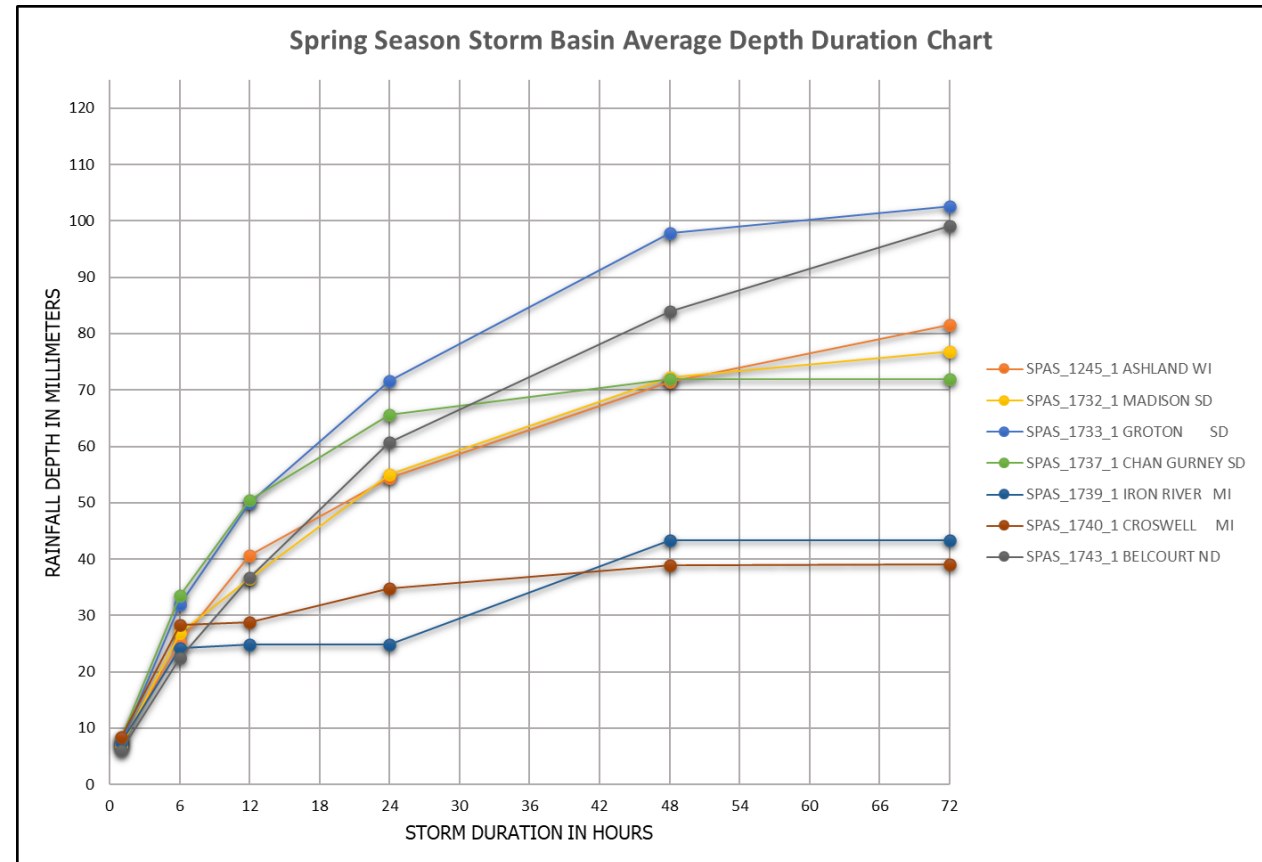
Example Results-Summer-Fall

- Various controlling storms



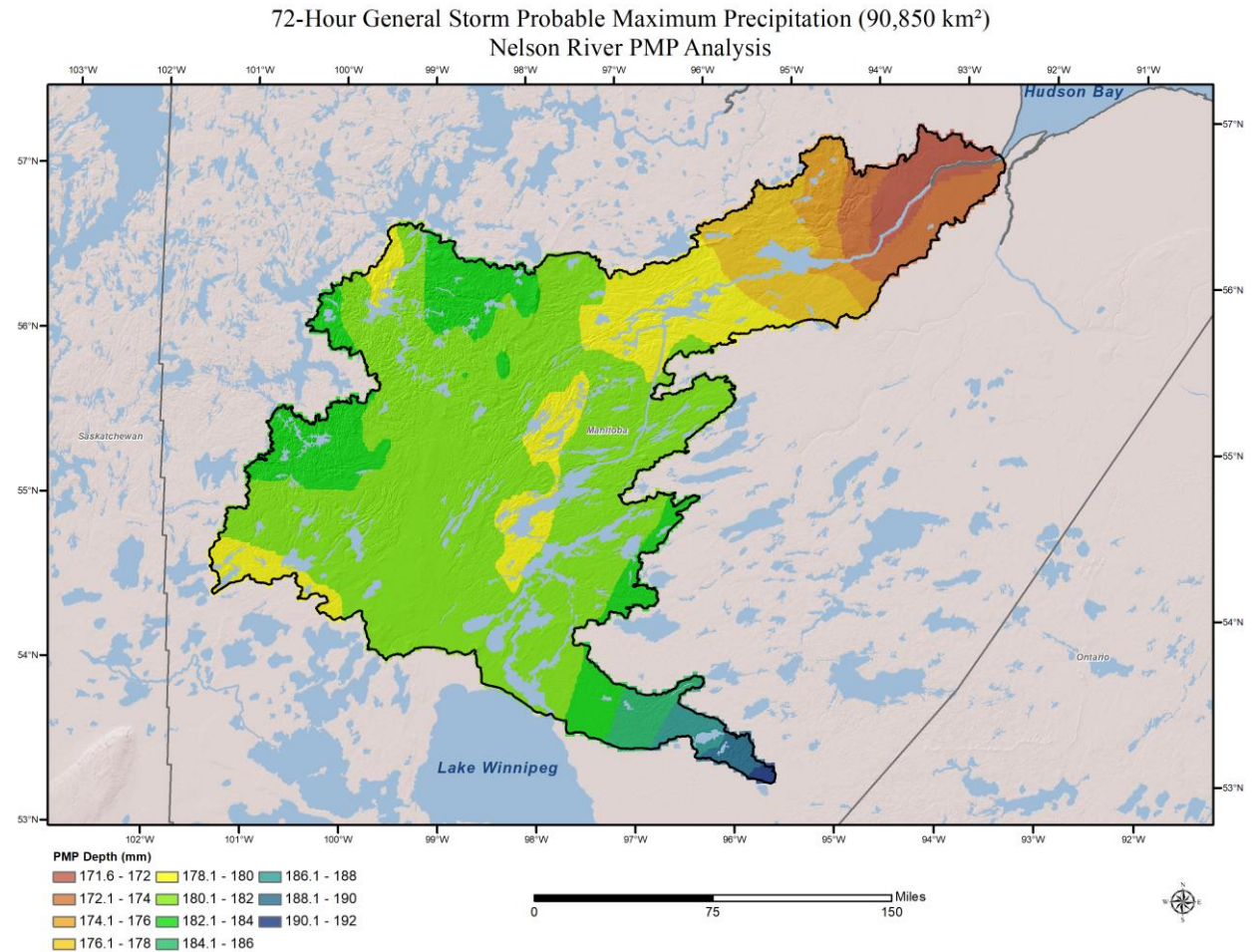
Example Results-Spring

- Various controlling storms



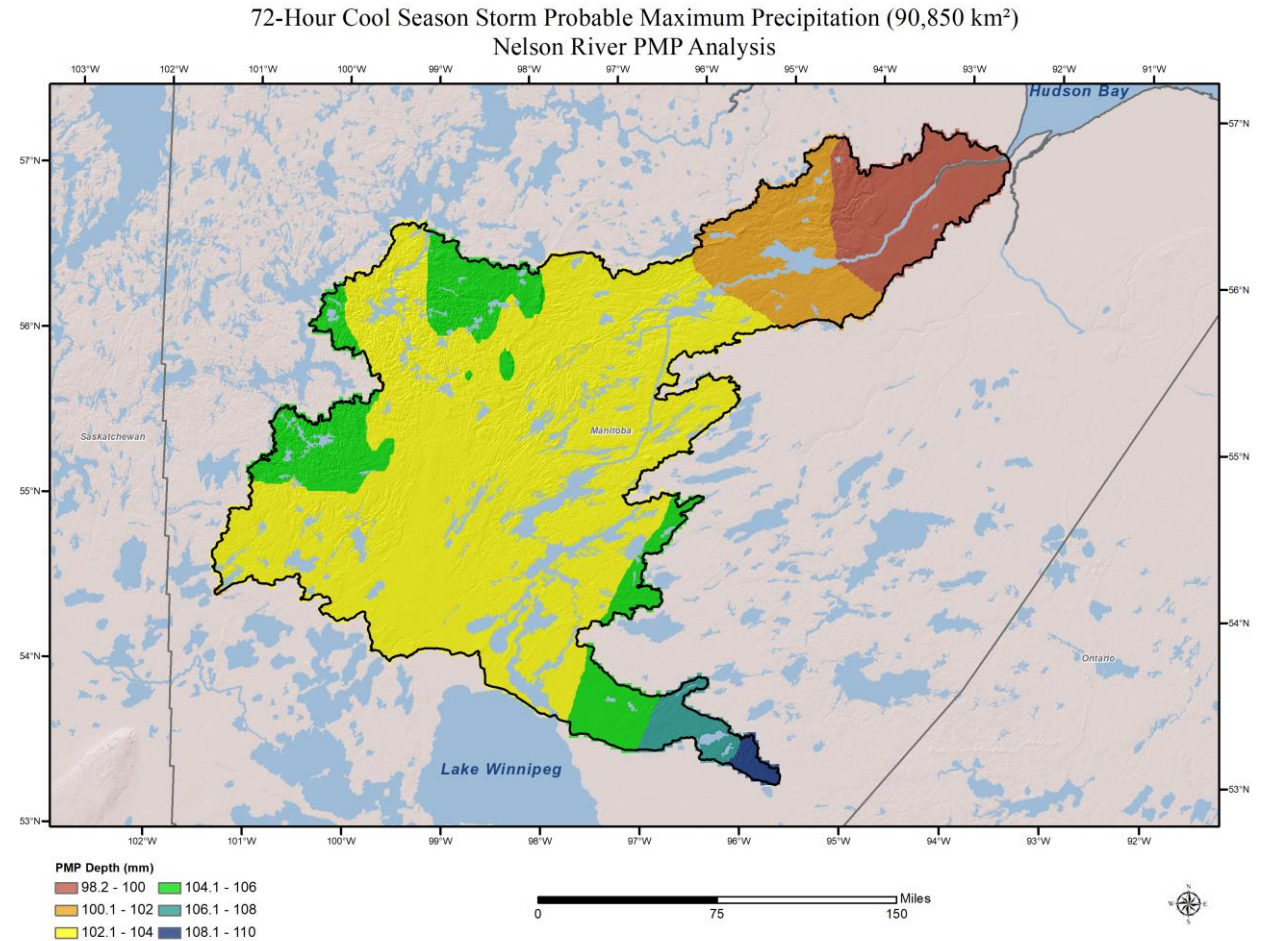
Example Results-Summer-Fall

- Gridded PMP
- Spatial options
- Temporal options
- Any combinations of basins



Example Results-Spring

- Gridded PMP
- Spatial options
- Temporal options
- Any combinations of basins



Comparisons and Conclusions

- Comparison to previous work-48hrs
- Updated storm database
- PMP tool for flexibility
 - Add new storm
 - Apply adjustments/improvements
 - Changes in climate
 - Reduction of uncertainty
 - Ability to test various scenarios

PMP Date	Previous PMP Depth	% Difference Spring Season (98.1mm)
1-Apr	47.2	52%
15-Apr	52.9	46%
1-May	72.4	26%
15-May	89.5	9%
PMP Date	Previous PMP Depth	% Difference Summer Season (169.4mm)
1-Jun	97.1	43%
15-Jun	103.3	39%
1-Jul	126.0	26%





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Thank you!

Questions?

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