West Nile Virus in Saskatchewan 2018 Summary

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Saskatchewan

Overview of 2018 West Nile Virus (WNV) Season

- WNV infection is an annual risk for Saskatchewan residents between June and September when the mosquitoes that transmits WNV to humans (*Culex tarsalis)* are present. The highest risk of WNV infection exists in the southern part of the province.

- In 2018, overall mosquito numbers were low due to the hot, dry conditions experienced throughout south and central Saskatchewan. However, the number of *Culex tarsalis* mosquitoes was above the five-year average and comprised a significant proportion of the mosquito population during July and August.

- A high percentage of *C. tarsalis* mosquitoes were infected with WNV. The highest transmission risk was from mid-July to early September.

- There were 52 WNV positive mosquito pooled samples out of 773 tested (6.7 %). There were 32 WNV positive horses and one positive alpaca.

- Three cases of humans with WNV neuroinvasive disease were reported in 2018.

- As WNV is established in Saskatchewan, the focus of public communications is to provide information about the risks of acquiring infection during the summer season and to promote prevention activities.

- The surveillance period began on June 3, 2018 (week 23) and ended on September 8, 2018 (week 36). Weekly risk assessments, website updates, and WNV prevention messages began on June 23, 2018 (week 25) and ended on September 15, 2018 (week 37).

- The northern-most positive WNV mosquito pool was detected in Prince Albert. West Nile virus has not been detected in this community previously and may indicate a broadening range for the *Culex* species in Saskatchewan.

Introduction

Since the introduction of WNV into Saskatchewan in 2002, 161 WNV neuroinvasive cases, including 17 deaths have been reported in the province. *Culex tarsalis*, the species mainly responsible for the transmission of the disease (i.e. the main vector) in the prairies and Great Plains states, is a common summer mosquito throughout the agricultural portions of Saskatchewan. Rarely found in the northern forested areas; it is primarily a rural, surface-water, grassland species that migrates into urban areas.

West Nile Virus Risk

Risk levels are determined by indicators, including *C. tarsalis* numbers and infection rates, degree-days (heat accumulation) and other relevant weather factors such as precipitation.

The risk of humans acquiring WNV infection depends on various factors including number and location of infected *C. tarsalis* mosquitoes, and number of days with sufficient heat. The risk of WNV

transmission is low in the spring but often rises through the early and midsummer period, reaching a peak during the latter part of July and August.

Risk Assessment, Communication and Prevention

Risk information assists the Ministry of Health in implementing public messaging or other preventative measures, such as mosquito control. Risk assessments based on indicators (mosquito numbers, infection rates, and other environmental variables) were completed by Ministry staff (Population Health Branch) on a weekly basis. Cumulative seasonal counts of WNV neuroinvasive disease in humans were reported on the website from June 23 (week 25) to September 15, 2018 (week 37).

HealthLine received 150 health information calls pertaining to mosquito or bug bites between January 1st and December 31st in 2018. 92 of these (61.3%) mentioned one or more symptoms including: fever, headache, body ache, or rash. Two callers (1.3%) mentioned "West Nile".

Mosquito surveillance - Permanent mosquito traps were set up in 16 communities throughout southern Saskatchewan to monitor *C. tarsalis* mosquitoes. On average, two Centers for Disease Control (CDC) mosquito traps, baited with carbon dioxide ran for two nights each week in each community except Saskatoon and Regina (where proportionately more traps are used).

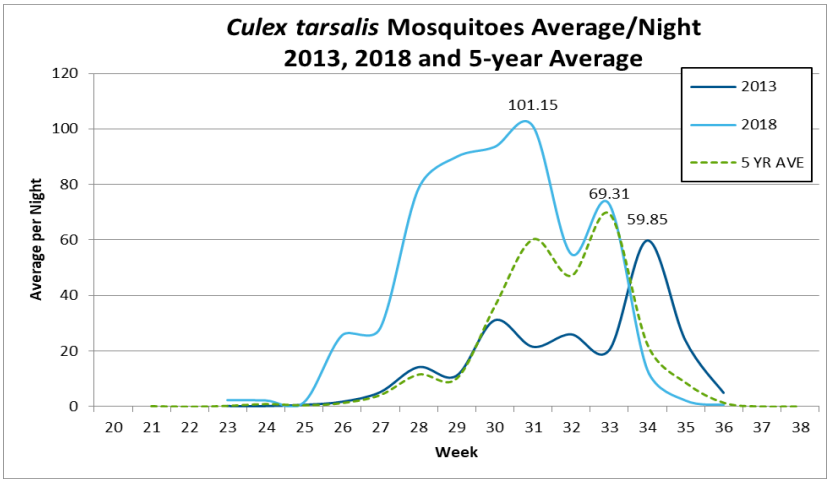
2018 Results

Mosquito Surveillance

- 132,473 mosquitoes were collected from CDC traps in 2018 – an 85% increase over the 71,704 mosquitoes collected in 2017. 15,426 (11.7%) of the total mosquitoes were identified as being *Culex tarsalis*, 271 were *Culex restuans*, and one was *Culex territans.* The average number of *C. tarsalis* mosquitos increased 5.0% in 2018 (11.7%) compared to 2017 (4.7%).

- The average number of *C. tarsalis* mosquitoes per night was higher in 2018 (101.15) throughout the southern half of the province compared to 2013 (59.85) (another high activity year) and the five-year average (69.31) (Figure 1).

Fig. 1: *Culex tarsalis* Mosquitoes Average/Night – 2013, 2018 and 5-year Average



- Numbers for the season were approximately the same in the mixed grassland (19.28/night) and moist mixed grassland/aspen parkland (20.01/night) Ecological Risk Areas (ERA). ERAs are based on ecological regions comprised of the mixed grass prairie, moist mixed grass prairie, boreal transition, and boreal forest. Numbers were much lower in the boreal transition ERA (2.05/night) with peak numbers occurring in week 30 (July 22-28) at 10.0/night.

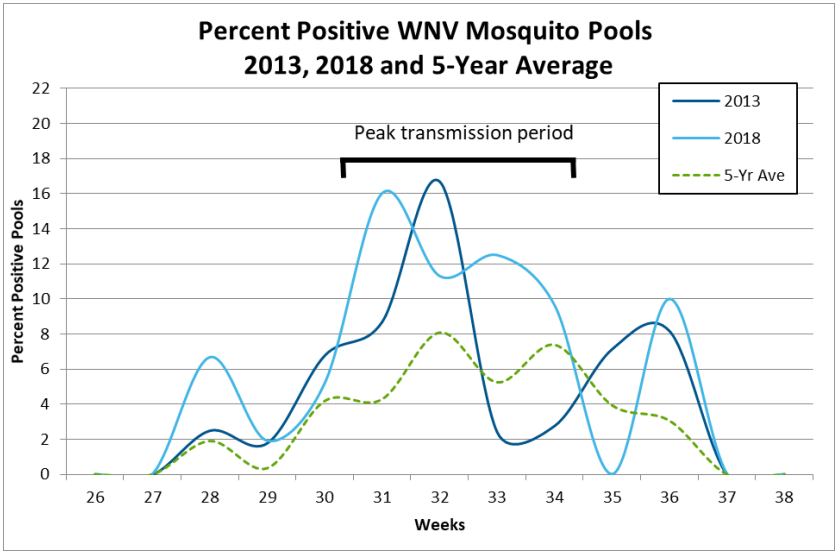
- Nuisance mosquitoes (those that do not carry WNV) were generally low in 2018 due to the hot, dry conditions experienced throughout most of the province. However, heavy rains from thunderstorms in late June and July produced large numbers of nuisance mosquitoes in a few localized areas. Numbers were as high as 4,366/night in late June and 2,412/night in late July at trap locations in Estevan with the dominant species being *Aedes vexans.* Other species included *Aedes dorsalis, Aedes flavescens*, and *Culiseta inornata*.

Mosquito Pools

- In total, 773 *Culex* mosquito pools were submitted for testing and divided by species (685 *C. tarsalis*, 87 *C. restuans*, and one *C. territans*). There were 52 positive mosquito pools (51 *C. tarsalis* and one *C. restuans*). The positive pools were widely distributed throughout southern Saskatchewan in the mixed grass, moist mixed grass, aspen parkland and boreal transition ERAs. The most northerly positive pool was from Prince Albert, which is the first ever positive pool from that community.

- The first positive pools in 2018 were from three pools of *C. tarsalis* mosquitoes collected from Estevan on July 10, 2018 (week 28). The last positive mosquito pool was collected from Regina on September 3, 2018 (week 36). The highest proportion of positive pools was collected during week 31 (16.0 %) (July 29 - August 4) with relatively high proportions continuing until week 34 (August 19 – 25) when 9.6 % of the pools tested positive (Figure 2).

Fig. 2: *Culex tarsalis* – Percent Positive Pools by Week 2013, 2018 and 5-year average



Mosquito Habitat and other Environmental Risk Indicators

Habitat

- Habitat conditions in April were warm and dry which substantially reduced the amount of shallow standing water available for mosquitoes. This resulted in lower than expected numbers, including *C. tarsalis*, in most areas of the province in spring and early summer.

- Scattered thunderstorms distributed large amounts of rainfall in June and mid-July in a few areas of the province, particularly in southeastern areas. Many ditches and other low-lying areas were flooded resulting in several emergences of mosquitoes.

Temperature and Degree-days

- Overwintered *C. tarsalis* females broke diapause (hibernation) in early April, when the snow pack melted and outside air temperatures exceeded the soil temperatures inside overwintering sites.

- Warm and dry weather in May accelerated *C. tarsalis* biting, egg-laying, and larval development. Mean monthly temperatures were 3-4° C above normal in May. Mean monthly temperatures were near normal in June, with rainfall 40-60 % of normal in southwest Saskatchewan and normal to above average levels in central and southeastern areas.

- Degree-day accumulations to the middle of July indicated that enough heat units had accrued (i.e. > 300) for the second generation of *C. tarsalis* mosquitoes to emerge in southeastern and south central areas. This generation was fully emerged in all southern areas by week 29 (July 15-21).

- By the middle of August, transmission was possible throughout all of southern and central Saskatchewan. However, transmission was possible for a longer period (> 10 days) in southern areas.

- The threshold for transmission was reached in week 25 (June 17-23) in Estevan and week 28 (July 8-14) in Saskatoon. The period of transmission in Estevan was approximately eleven weeks (June 17 – September 1) before being interrupted by cold temperatures early September. The period of transmission in Saskatoon was approximately eight weeks (July 8 – August 25). By comparison, the threshold for transmission was reached for three weeks in North Battleford from July 29 – August 18).

Horses and Alpacas

- There were 32 WNV infected horses and one WNV infected alpaca in 2018. The first infection was diagnosed on July 30, 2018 (week 31) and the last was diagnosed on October 2, 2018 (week 40). As in previous years, WNV infections in horses occurred throughout August and into September.

Humans

- There were 50 specimens (blood - 48, cerebrospinal fluid - two) positive for WNV reported by the Roy Romanow Provincial Laboratory (RRPL) in 2018. However, it is not known how many of

these positive specimens were duplicate or multiple samples from the same individual. A positive laboratory test does not necessarily indicate a current infection. It may represent a WNV infection from the previous year or cross-contamination with another virus.

- There were seven blood donors positive for WNV ribonucleic acid test reported by Canadian Blood Services in 2018. It is not known whether these positive blood donors are also test positive as reported by RRPL.

- There were three persons with WNV neuroinvasive disease reported in 2018 compared to zero in 2015 and 2016, one in 2014 and 2017 and seven in 2013.

Mosquito Control and Prevention

- No spraying for adult mosquito control was required in any community during the 2018 WNV season.

Discussion

In 2018, *C. tarsalis* biting and egg-laying activity and WNV transmission started earlier than in previous years due to the warm, dry conditions that occurred throughout much of province, and in particular southwestern Saskatchewan. As a result, the period of virus transmission began earlier in July and continued through August, before ending abruptly in early September. Peak transmission occurred over a five-week period from the end of July to the end of August.

The continuing dry conditions experienced throughout much of southwestern and central Saskatchewan substantially reduced mosquito numbers, including *C. tarsalis*. However, *C. tarsalis* numbers were higher than average in those areas that had significant rainfall in June and July, most notably in southeastern areas.

The higher proportion of infected mosquitoes resulted in a larger number of human and equine infection. Infected mosquitoes and horses were detected throughout much of the province and as far north as Prince Albert. When compared to the five-year average, 2018 results were similar to 2013. Although WNV transmission was relatively high during the month of August in 2013 and in 2018, it did not continue into September in 2018. Warmer temperatures in 2013 allowed *C. tarsalis* biting activity to continue for approximately two weeks into September. This temperature variation helps to explain the higher number of neuroinvasive cases detected in 2013 (seven) compared to those detected in 2018 (three).