Summary of Activities

Date: November, 2016

To: Ian Kitch
Manitoba Sustainable Development
cc. Lloyd Rowe, Jonathan Stephens

From: Holly Urban, Brock Koutecky & Megan Paterson - Swan Valley Sport Fishing Enhancement Technical Staff
Contact: svsfe@mymts.net

Subject: Musky Suitability Assessment of West Watjask Lake

Location: West Watjask Lake, Duck Mountain Provincial Forest, MB

Background Info: In the late 1980's, Fisheries Branch conducted perch removal on West Watjask Lakes to determine stock responses. The study was conducted to determine if heavy cropping of perch would result in higher growth rates to a existing stunted perch population. This slow growth was hypothesised to be due to overpopulation and intraspecific competition. Results indicated that removal of larger age classes resulted in increased growth of older cohorts in the waterbody. This study was conducted over one year and very little conclusions were drawn. The report concludes that improving benthic and planktonic production and subsequently monitoring perch growth may have been useful (Lysack, 2001).

In the summer of 2015, SVSFE technicians assessed West Watjask Lake to determine if the waterbody had potential for stocking game fish species. This comprehensive study included morphometry analysis; including a bathymetric survey, vegetation mapping, and habitat mapping. Also it required water chemistry analysis in multiple locations, along with dissolved oxygen (summer and winter). Lastly a basic fish inventory survey was completed. The report for this study is quite lengthy; for reference see Prj 15-004 SVSFE's IFIA Summary of Activities.

Following assessments it was determined to investigate the idea of muskellunge introductions. In 1996, fisheries biologist Ken Kansas, suggested a muskellunge transfer from Twin Lake to West Watjask Lake. A dietary study of muskellunge in Wisconsin identified that the main food source over each season is yellow perch and white sucker. In the same study (Bozek, 1999) states "We believe that substantial biomass of yellow perch and catostomids in waters receiving stocked muskellunge would be beneficial successful muskellunge stocking program". Line Lake, which is located approximately 40km North-East of West Watjask, was a very successful musky lake over 10 years until the lake winterkilled and the musky program was ceased due to problems acquiring muskellunge stock. Interestingly, Line Lake and West Watjask are both similar in nature with large yellow perch populations and no know castomid population. For this reason, in terms of forage ability, natural characteristics, and northerly location there is a high level of confidence that musky stocking would be successful in West Watjask Lake. SVSFE reviewed a muskellunge habitat suitability index from the Habitat Index Models for Muskellunge created by the Fish and Wildlife Service, USA, 1987 (Cook et el 1987). Following 2015 assessments, known parameters scored very high in the suitability index though there were a few parameters still unknown as the index was reviewed following assessments. Parameters included relative abundance of forage <12cm, maximum water temperature epilminion, percent of vegetated area, along with three parameters focusing on natural recruitment success.

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Results: In 2016, SVSFE further assessed West Watjask in order to strengthen confidence in Muskellunge Suitability Index. On May 10th, a HOBO temperature logger was installed in the south bay of the lake. The logger was deployed at 1m of depth in 2m of water in a highly vegetated area. The logger was left to collect temperature information until October 26th 2016. Also, nearby a spring dissolved oxygen reading was conducted in potential spawning and nursery areas (1m) of vegetated area with high fibrous content, as requested from habitat suitability index (See page 3).

In the winter of 2016 (January, February and March), SVSFE technicians conducted dissolved oxygen testing on both West and East Watjask Lake(s). Results indicated that throughout multiple testing locations dissolved oxygen does not appears to be an issue. In March, dissolved oxygen at main basin locations remained greater than the 3mg/L threshold up to 3m in depth along with levels remaining >9mg/L at the surface. Historical dissolved oxygen testing also suggest this parameter should not be an issue in over wintering large bodied fish. Muskellunge should be able to overwinter with no adverse affects in lakes that maintain at least 3.0mg/L dissolved oxygen during ice covered periods (Cook, 1987).

From July 4-6th, 2016 a comprehensive forage assessment was conducted on West Watjask Lake. In order to calculate volumetric requirements of forage, it would have been necessary to complete a mark and recapture study with a time period between capture methods required for mixing. The suitability index requires a relative abundance of forage in in terms of volume (forage <120mm per cubic meter). Due to the time and effort that this would require, it was decided to conduct a very labour intensive forage assessment within the short period developed by Dauphin Fisheries Staff, Lloyd Rowe in order to gather a greater understanding of forage, as well as a develop a baseline study that would be replicable for "keeping a close eye" on forage post predator (muskellunge) introductions. The protocol agreed upon is as follows:

The lake was broken down into nine total transects, seven of which had enough wetted area to allow for three gill nets. For each of the seven transects, one net was to be set in each desired depth strata (0-4m, 4-8m, and 8-12m). If 8-12m strata was not present 0-4m was substituted. To adequately cover surface area and volumetric requirements, it was determined that each gill net was separated by 200m to provide accuracy for obtaining yellow perch populations. This protocol also required replicate sets from 2015 perch assessments for comparative CPUE measures. Each 2" gill net was set for a period of one hour. Two standard gangs were set overnight to capture perch that feed in littoral areas under darkness, with one set replicated from 2015 assessments. Also a total of four small-mesh trap nets were set for a minimum of 18hours in four of the seven transects, again allowing for one net being replicated from 2015 forage assessments. Results are as follows:

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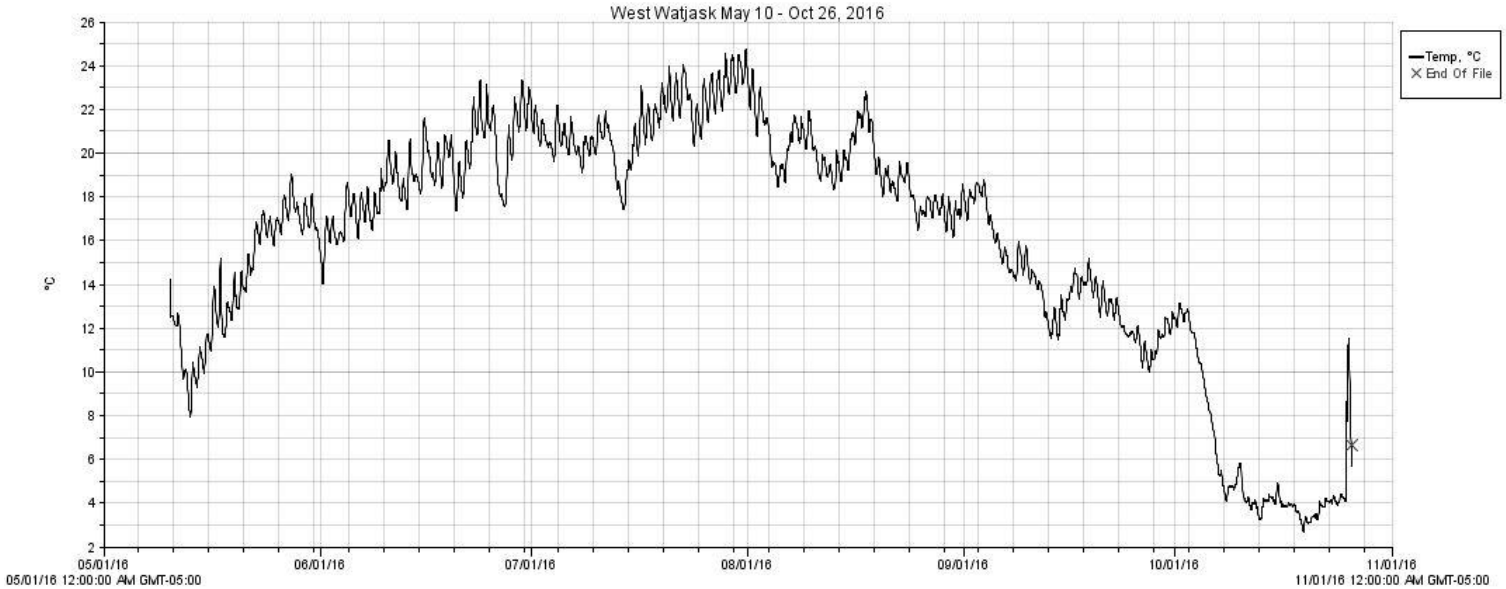
West Watjask Temperature Logger (HOBO) 2016



May 10th 2016 Dissolved Oxygen Profile (Potential Spawning and Nursery Areas)

Dissolved Oxygen (Spawning & Nursery Areas)						
Date	Depth (m)	DO (mg/L)	Temp (°C)	UTM	Vegetation Present:	Bottom Type
May 10 2016	0	8.47	12.7	14 U 330783 5724490	Pondweed, Coontail, Chara	Softmix, BOD
May 10 2016	0.5	8.48	12.7	14 U 330783 5724490	Pondweed, Coontail, Chara	Softmix, BOD
May 10 2016	1	8.82	12.6	14 U 330783 5724490	Pondweed, Coontail, Chara	Softmix, BOD

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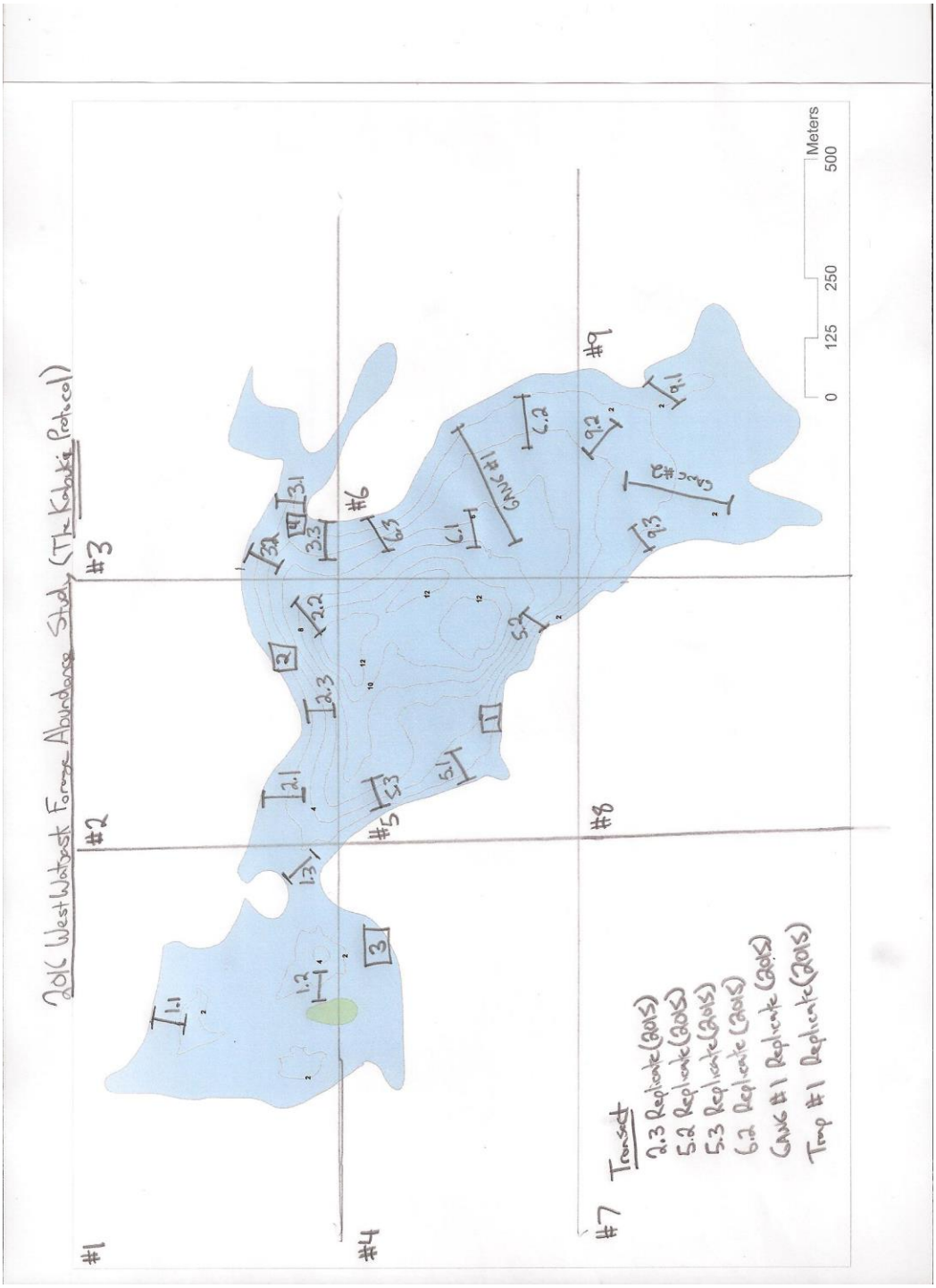

Figure: 2016 West Watjask Forage Assessment Program

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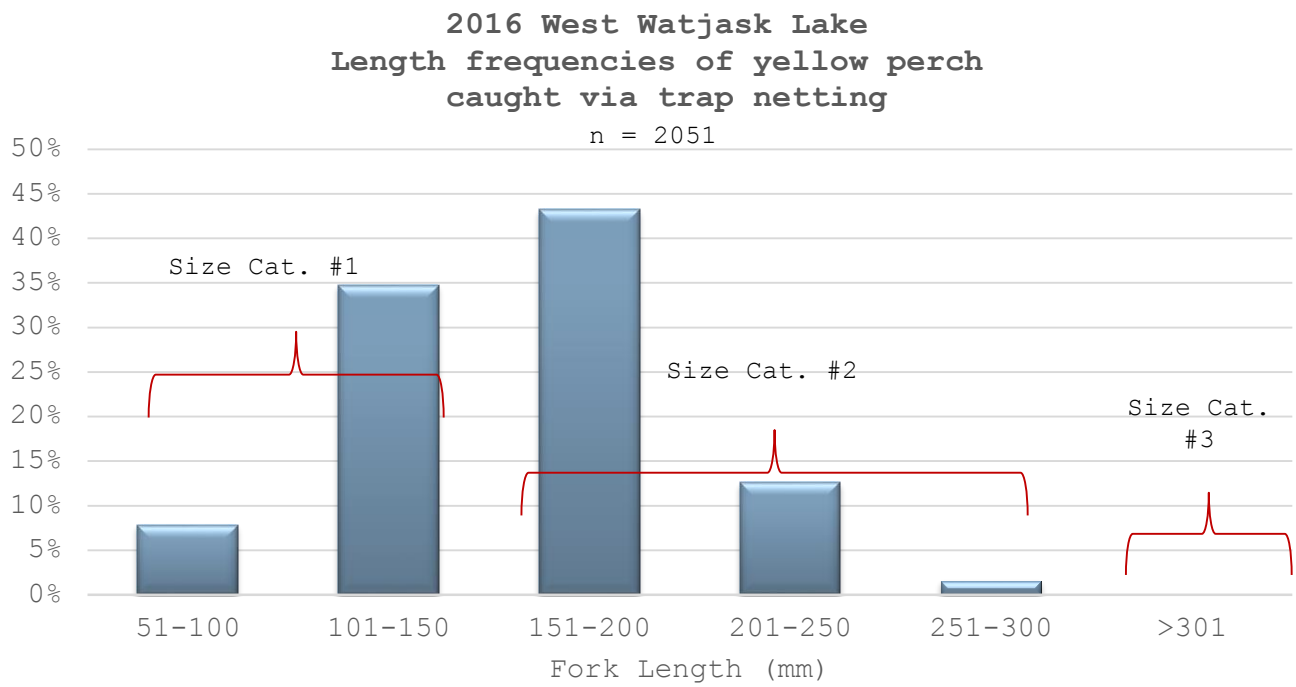
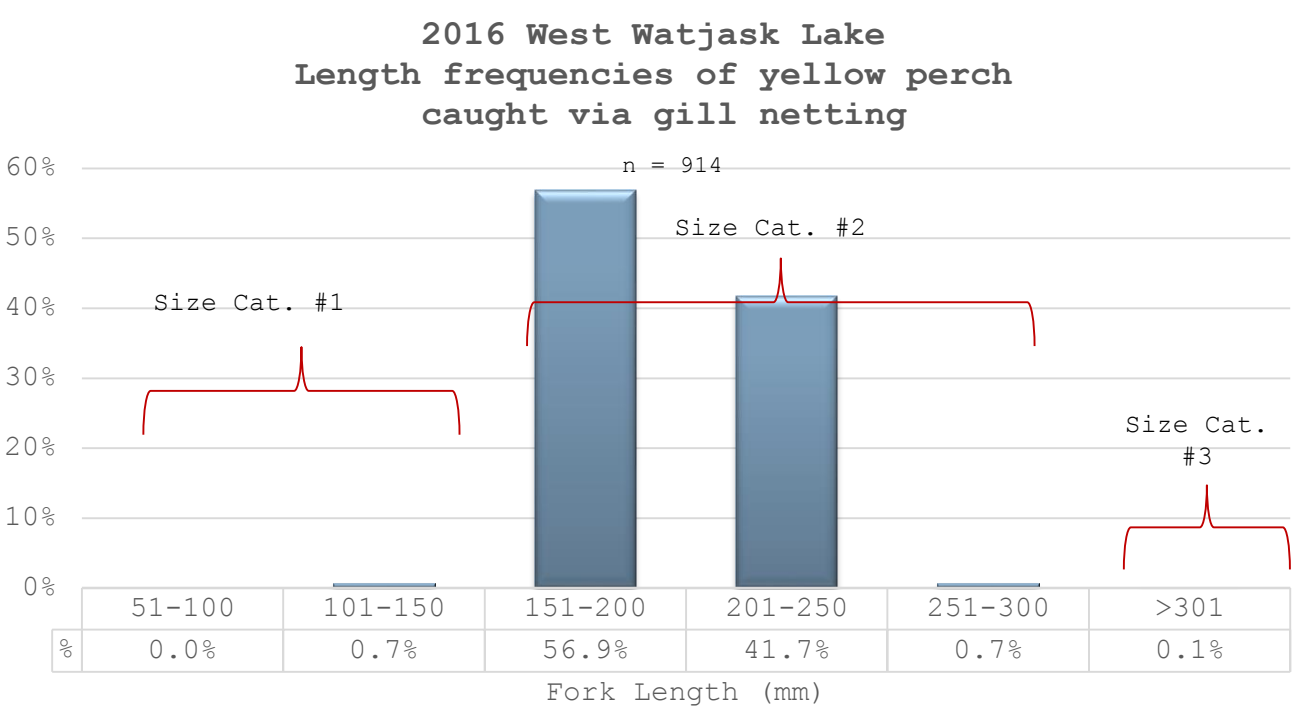
2016 Forage Assessment Results:





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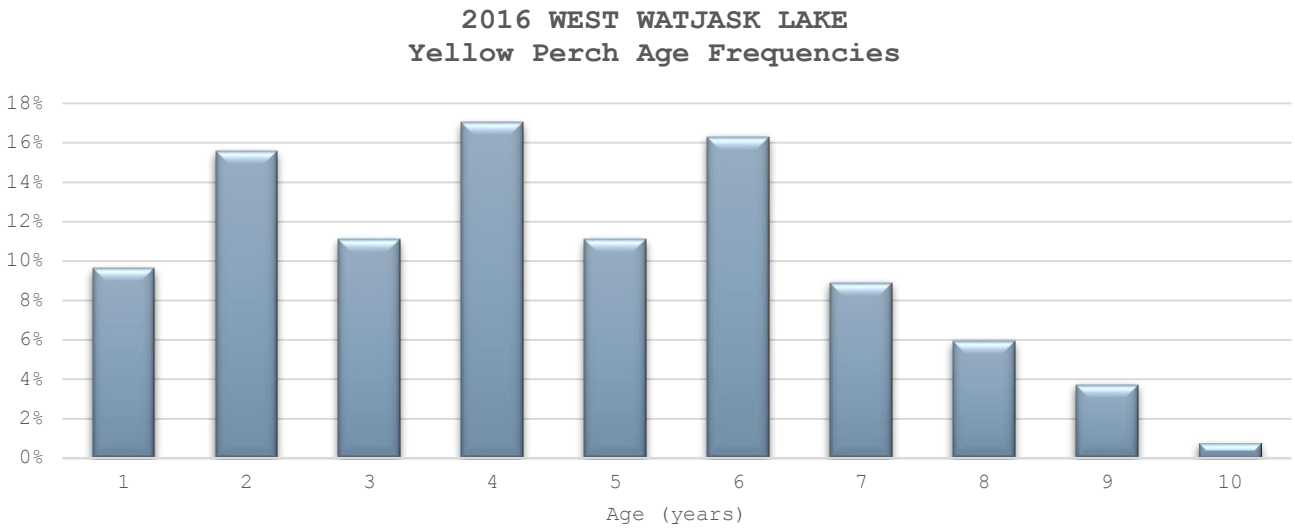

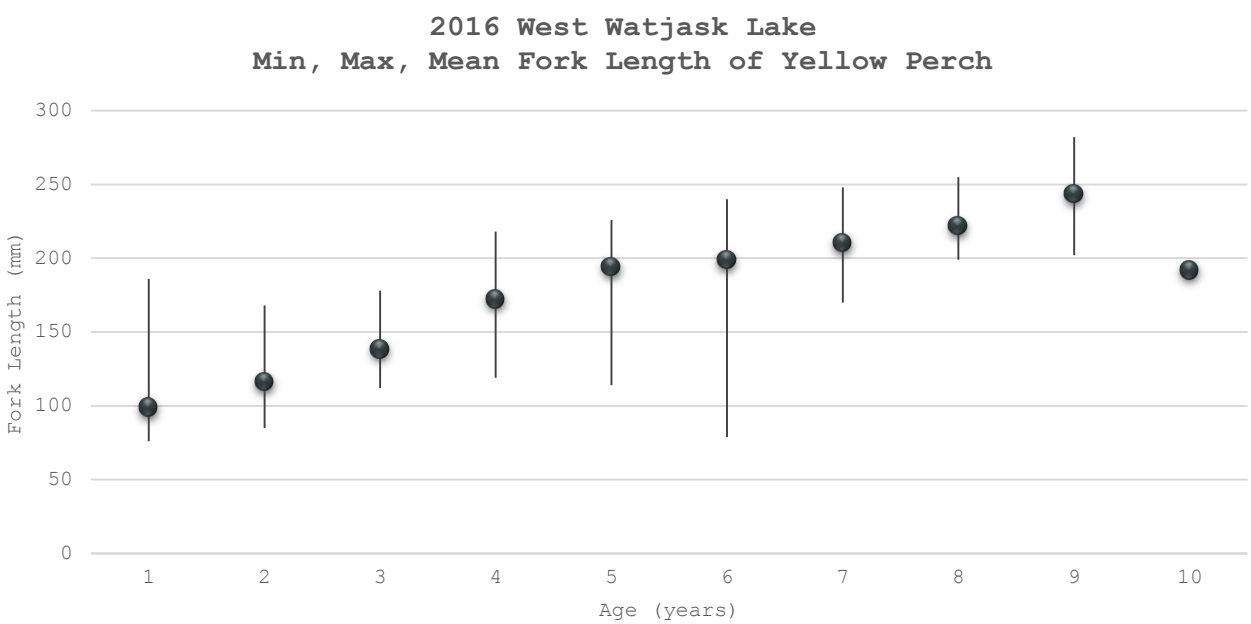

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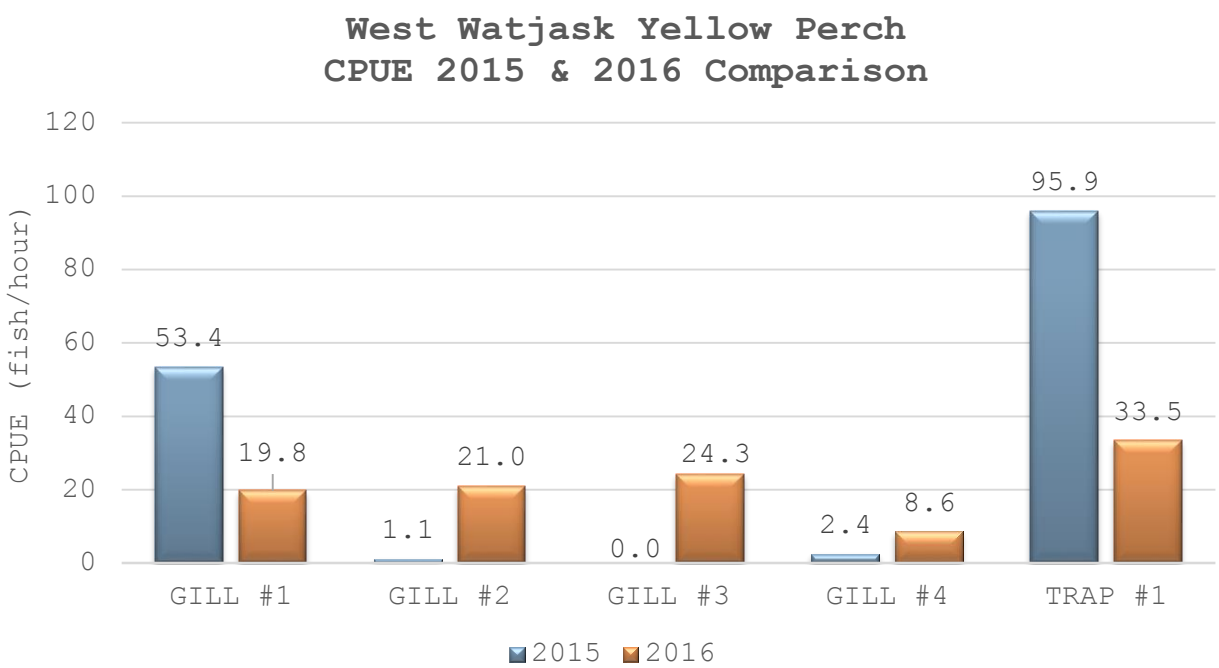

As stated earlier, this forage protocol was developed to (1) gather a greater understanding on the length, abundance, and composition of forage and (2) to develop a replicable program as a baseline if issues of forage ever arise after predator introductions. It is also important to state that the assessments were conducted with Dauphin fisheries staff, Lloyd Rowe present. Lloyd, who developed this particular program had suggested that further forage analysis be conducted prior to muskie introductions.

In terms of trap netting, it became apparent that this method was most effective in the catchment of smaller length frequencies of yellow perch. Total catch per unit effort (CPUE) over the full trap netting effort (four traps) equated to 23.3 fish/hour. In total 2051 fish were captured via trap-netting. Fish ranged from the 71mm to 298mm with an mean length of 157.96mm. In the important length categories pointed out in the suitability index, 43% of the catch were between 51-150mm, 57% were between 151 and 300, and 0 fish (0%) were >301mm. Trap netting efforts were carried out primarily to gather more length information on yellow perch populations in West Watjask Lake, this was achieved.

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2016 Forage Assessment Results:

In terms of gill-netting, a total of 18 short set gill nets (avg 1.02 hrs per set), and two overnight gangs were set (avg 16.72 hrs per set). Total gill netting effort equated to 51.9 fishing hours. The short set nets were 50m gangs (2 x 25m panels) of alternating 2″ monofilament and 2″ nylon. The standard gang consisted of 250m (50m panels of 2″, 3″, 3 ¾″, 4 ¼″, and 5″) nylon net. Gill netting collected larger length frequencies of fish suggesting larger individuals typically prefer greater depths. Total catch per unit effort (CPUE) over the full gill netting effort (18 short sets, and 2 overnight gangs) equated to 17.6 fish/hour. In total 914 fish were captured via gill netting. Fish ranged from the 114mm to 315mm with an mean length of 200.2mm.

In the important length categories pointed out in the suitability index, 0.7% of the catch were between 51-150mm, 99.2% were between 151 and 300, and 1 fish (0.1%) was >301mm. Population estimation of the smaller length frequencies (51-150mm) was verified through trapping efforts. In terms of gill netting, technicians made notes on parasite loads. In total 83% of the perch possessed a parasite; either blackspot(neascus),or yellow grub. 18% of fish possessed blackspot, 35% possessed yellow grub, and 30% both yellow grub and blackspot. From gill netting efforts fish fork length and weight were recorded. Average condition factor of all yellow perch captured from gill netting efforts equated to a condition factors of (k=1.2) suggesting fish are in good overall health. In terms of overnight gangs fish were collected and therefore more data was obtained from these fish. Of the 84, 63 were mature females and 21 were mature males, suggesting a 3:1 female to male ratio in the subsample. In terms of stomach contents, forage identified were fish remains, invertebrates (unidentified), snails, leech, mayfly, crayfish, clams, and chronomids. Of the 84 stomachs analyzed, 39 were empty (46%), 40 were full (48%), and five contained digesta (6%). Also, the one fish which contained fish remains, also appeared to be feeding on invertebrates.

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Habitat Suitability Model – Muskellunge: Furthermore, West Watjask Lake characteristics were compared to a "Habitat Suitability Index Model for Muskellunge", written by the Fish and Wildlife Service of the US Department of the Interior (Cook et el 1987). This model incorporates a list of "muskellunge life requisites", or variables/rates scaled from 0 (unsuitable habitat), to 1 (optimal habitat). Habitat variables are grouped into four categories including food, water quality, cover/reproduction, and other. Below are a list of the variables and how they scored on West Watjask Lake. **Note:** 2/3 variables pertaining to muskellunge spawning habitat not documented at this time as successful natural recruitment is not of top priority in terms of management.

1. Water Transparency: >1m optimal – West Watjask 3m **Score: 1**
2. Relative Abundance of Forage <12cm: Although we know that forage (<12cm) are extremely abundant. Index requires figure in prey/cubic meter – which at this point is unknown. **Score: Unknown**
3. Size Diversity of Forage Fish: We found that 2 size classes (0-150mm and 151-300m) were present in large numbers, fish in third class size are very scarce (>300mm). **Score: 0.8**
4. Dissolved Oxygen Winter: According to records (2016, 2002, 1997, 1996) Winter DO appears to be no issue: **Score: 1**
5. Maximum Water Epilimnion: Max mid-summer range 20°C to 30°C – 1 data set acquired (2016, max temp achieved 24.73°C on July 31) **Score: 1**
6. Percent of Lake Vegetated Area: Optimal 25%-75%. 63.6ha <4m = 66% **Score: 1**
7. Dissolved Oxygen in Spawning Areas (Spring): Refer to Table (Page 3) **Score: 1**
8. Drop in Water Level During Critical Periods: **Score: Unknown**
9. Ratio of Spawning Habitat to Summer Habitat: **Score: Unknown**
10. Northern Pike Density: No presence (optimal): **Score: 1**
11. Water Body Size: 85ha: **Score: 0.9**

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Recommendations/Suggestions: At current, West Watjask gets a passing grade on 7/7 of the relevant known index parameters excluding the parameters in reference to natural recruitment success. The unknown of relative abundance of forage <120mm, can not be calculated due to time constraints in the 2016 field season. Regardless, we are confident that although we do not currently possess the volumetric numeric value, that the parameter would get a passing grade based on current forage information. In terms of the total 11 parameters, West Watjask gets a passing grade on 8/11 of the parameters. Parameters lacking scientific backing include drop in water levels during critical periods, and ratio of spawning habitat to summer habitat. These coefficients would require (1) multiple years of monitoring lakes levels, and (2) a comprehensive habitat assessment using extensive data mapping. In summary, West Watjask gets a passing grade, and we are highly confident that at a proper stocking rate, muskellunge would grow to a size that would attract anglers. At this point, successful natural recruitment would be a bonus, as the current management objective is to attract anglers to one of Manitoba's very few muskellunge fisheries, and not necessarily to create a self-sustaining fishery, although appealing.

Muskellunge stocking is scheduled for the spring of 2017. The agreed upon stocking rate was determined at two fish/acre. This stocking rate was discussed amongst multiple individuals, and it was resolved that this rate would be acceptable and account for natural mortalities. A total of 450 individuals, approximately 12" spotted muskellunge, from Minnesota Musky Farms in Alexandria, MN are scheduled to be delivered in May of 2017. West Watjask Lake is 96.2ha (237.7ac) with 450 individuals equates to an initial stocking rate of 1.89 fish/acre. Below are infrastructure & monitoring suggestions:

1. Develop mandatory signage (Catch & Release techniques, and illegal fish transferring signage) and install at lake access.
2. Propose no-kill regulations on West Watjask Lake for the 2017 angling guide
3. Acquire necessary permits and develop parking and launching areas
4. Summer of 2018 conduct monitoring program to quantify both stocking success and forage response to predator introductions.
5. As requested by Roblin Economic Development, develop a response plan if Muskellunge appear in nearby stocked trout waters.
6. If serious negative response to forage, consider castomid introductions.
7. If successful, consider muskellunge stocking into East Watjask Lake, if unsuccessful, consider stocking different predatory game fish species.

Muskellunge is an extremely sought after game/trophy fish species in Manitoba. At a time where musky fishing is hard to find in our province, there is without a doubt that an initiative like this would become very popular, if successful stocking occurs. This small stretch of the Western Region along the west side of the Duck Mountains could become and even greater angling destination.

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Literature Cited:

Bozek, M.A., Burri, T.M. 1999 Diets of Muskellunge in Northern Wisconsin Lakes

Brown, T.G., Runciman, B., Bradford, M.J., and Pollard, S. (2009) A Biological Sypnosis of Yellow Perch (Perca flavescens). Fisheries and Oceans Canada. Canadian Manuscript Report of Fisheries and Aquatic Sciences 2883 pp.

Cook, M.F., and Solomon, R.C., (1987) Habitat Suitability Index Models: Muskellunge. U.S. Fish Wildlife Service Biology. 82 (10.148) 33pp.

Kansas, K. (1996) Mantioba Conservation and Water Stewardship: Fisheries Branch. Speed Memorandum June 7, 1996

Krieger, D.A., Terrell, J.W. and Nelson, P.C. (1983) Habitat Suitability Information: Yellow Perch. US Fish and Wildlife Service. FWS/OBS-83/10.55. 37 pp.

Lysack, W., (2001) Fisheries surveys of Duck Mountain Lakes. Manitoba Conservation Fisheries. Manuscript Report No. 01-01

Mecozzi, M. (2015) Yellow Perch in Wisconsin. Wisconsin Department of Natural Resources. Madison Wisconson. Obtained October 2015 from: http://dnr.wi.gov/topic/fishing/documents/species/yellowperch.pdf

Ridgeway, L.L., and Chapleau, F. (1994) Study of a Stunted Perch Population of Yellow Perch (perca flavescens) in a monospecific lake in Gatineau Park, Quebec. Ottawa-Carleton Institute of Biology. 72: 1576-1582

Roberge, M., Slaney T., and Minns, C.K., (2001) Life History Characteristics of Freshwater Fishes Occurring in British Colombia, with Major Emphasis on Lake Habitat Characteristics. Can. Man. Rep. Aquat. Sci. 2574:189 pp.