Summary of Activities

Date: November, 2016

To: Ian Kitch
Manitoba Sustainable Development – Fisheries Branch
cc. Lloyd Rowe, Jonathon Stephens

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

Subject: *Gull Lake Historical Review, 2016 Assessments & Suggestions for further Management*

Study Rationale: Gull Lake has a long history of being a very popular trout destination within the Duck Mountain Provincial Park. In recent years, the lake has been invaded with yellow perch populations which have been hypothesised to be the primary reasoning behind decreased trout angling quality. For this reason SVSFE set out in the 2016 open water season to (1) further quantify these perch invasions (2) remove as many non-salmonid species during assessments as possible, and (3) come up with a constructive, yet economically viable management plan for Gull Lake.

Lake History: Gull Lake has a long management history which goes back to the 1960's. In it's history, the lake has been stock with every hatchery reared salmonid species with the exception tiger trout. In terms of the natural fish community pre-1960, no historical data has been located and therefore referenced at this point. The first stocking occurred in 1962 with stocking the brook trout and lake trout hybrid, splake. Closely following this initial stocking, in 1963 the lake was stocked with lake whitefish, which have "made themselves right at home" in Gull Lake. Today, Gull Lake provides anglers with the only lake whitefish angling opportunity in the Duck Mountains. Since this initial stocking the lake has been stocked with a variety of difference species including splake, kokanee, rainbow trout, brook trout, spar, and brown trout. In most recent years (from 1990 onwards) the lakes primarily stocked species have been rainbow trout, brook trout, and splake.

Master Angler Awards Review:

In accordance to the master angler awards, the lake has produced a number of master angler submissions including 15 arctic char/sparr, 123 brook trout, 5 brown trout, 2 kokanee, 265 lake whitefish, 707 rainbow trout, 232 splake, 1 white sucker, and 5 yellow perch. Today, a prevalent population of white suckers exist in Gull Lake, and it is hypothesised that they have always existed in the lake. Yellow perch, according to known records have not. The first yellow perch master angler was submitted in 2007. According to Bill Pollock, an avid fly angler from Roblin who has fished the lake religiously over the years stated, "I would say the first time I noticed them as a problem was in 2014, but had heard of other anglers mentioning them at least three years previous to that" (Pollock, 2016). Bill also stated that in the fall of 2016, he was impressed by the small number of perch that he had caught while using small flies targeting whitefish (Pollock, 2016). Following is the master angler submissions and stocking records for rainbow trout, brook trout, and splake from 1990-2016. The lake whitefish database is included as well.

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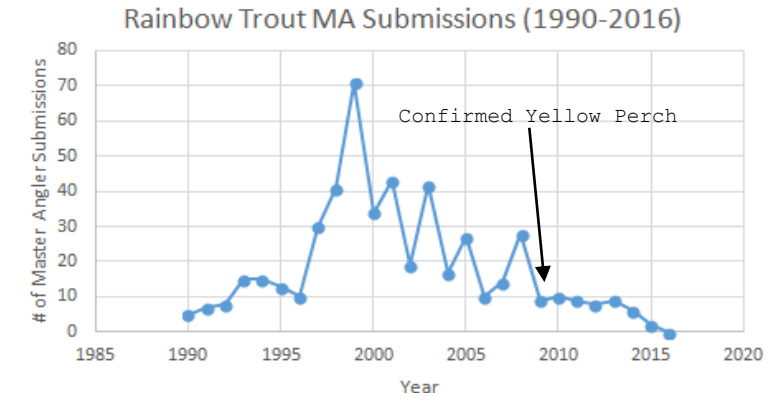

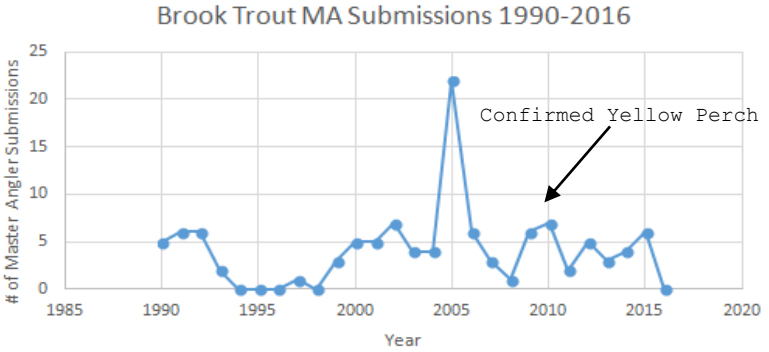

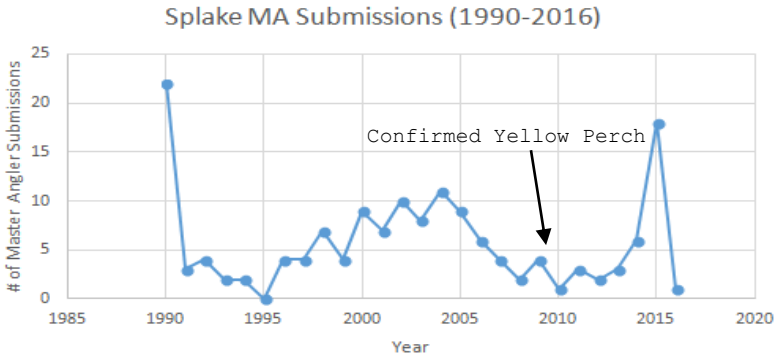

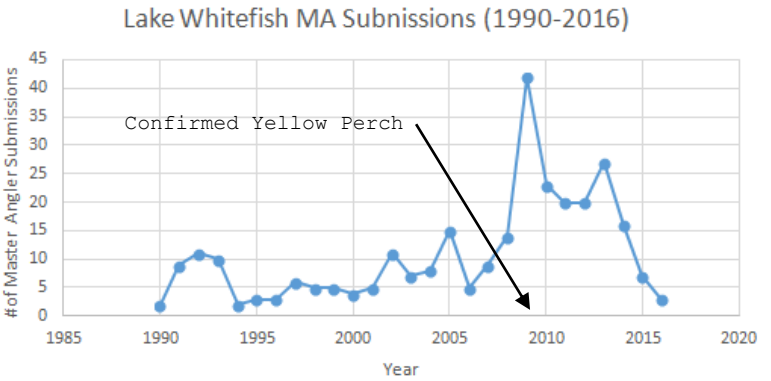

Year	Species	Time	Rate	Size
1991	RNTR	May	14,000	1+
1992	RNTR	May	16,000	1+
1992	RNTR	April	6,000	1+
1992	RNTR	July	5,000	1+
1993	SPLA	NA	15,000	1+
1993	RNTR	NA	20,000	1+
1993	RNTR	NA	25,000	1+
1994	BRTR	April	7,500	18+
1994	BRTR	April	15,000	18+
1994	SPLA	June	10,000	Fingerling
1994	RNTR	September	20,000	12-15cm
1995	SPLA	June	10,000	Fry
1995	RNTR	September	15,000	12-15cm
1996	RNTR	October	17,500	12-15cm
1996	SPLA	August	10,000	Fingerling
1996	BRTR	October	13,000	Fingerling
1997	BRTR	July	13,000	Fingerling
1997	RNTR	July	30,000	Fingerling
1997	SPLA	July	5,000	Fingerling
1998	RNTR	NA	20,000	12-15cm
1999	SPLA	June	24,000	12-15cm
1999	BRTR	October	5,000	12-15cm
1999	RNTR	October	7,000	12-15cm
2000	RNTR	NA	15,000	12-15cm
2000	BRTR	NA	5,000	12-15cm
2001	SPLA	July	7,000	12-15cm
2001	RNTR	NA	15,000	12-15cm
2001	BRTR	NA	1,800	12-15cm
2002	RNTR	September	15,000	12-15cm
2002	BRTR	September	8,800	12cm
2002	SPLA	May	5,000	12-15cm
2003	SPLA	June	5,000	12-15cm
2003	RNTR	NA	19,500	Fingerling
2003	BRTR	NA	5,000	Fingerling
2004	RNTR	September	25,000	12-15cm
2005	SPLA	June	10,000	12-15cm
2005	RNTR	September	15,000	12-15cm
2006	RNTR	September	15,000	12-15cm
2007	RNTR	September	15,000	12-15cm
2007	BRTR	September	5,000	Fingerling
2008	RNTR	September	10,500	12-15cm
2008	BRTR	September	5,000	12-15cm
2008	SPLA	September	5,000	12-15cm
2009	BRTR	June	6,200	18+
2009	RNTR	September	15,000	Fingerling
2010	RNTR	May, June	9,000	18+
2010	BRTR	September	5,000	12-15cm
2010	SPLA	September	6,000	18+
2011	RNTR	June	5,500	18+
2011	RNTR	September	18,000	12-15cm
2012	RNTR	September	20,000	12-15cm
2013	RNTR	June	5,000	18+
2014	BRTR	May	5,000	18+
2014	RNTR	June	8,000	18+
2014	BRTR	September	5,000	18+
2014	RNTR	Sept, Oct	15,000	12-15cm
2015	BRTR	Sept, Oct	15,000	12-15cm

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Master Angler Awards Review cont'd:

When looking at stocking records and master angler submissions, no concrete conclusions can be made primarily because there is lacking information regarding trout growth in Gull Lake. At this point it is important to acquire a significant sample size and determine the average age frequency at which trout species reach 500mm within this particular system. When making the educated assumption that master angler fish are aged 5+ or 6+ (average master trout ages in other duck mountain trout lakes) some interesting trends can be noted. Again, these are assumptions but high master angler submissions at assumed ages for all three trout species either correlate with spring or summer stocking. If significant ages were acquired, one could accurately correlate which stocking resulted in high submission years. With regards to trend analysis, it becomes obvious that submissions of both rainbow trout, brook trout, and whitefish appear to decline after the presence of yellow perch was confirmed. There is significant literature suggesting that once yellow perch invade a system, growth and survival of both brook and rainbow trout is compromised. In terms of lake whitefish, this is likely just a coincidence, as currently there is no significant information suggesting that yellow perch negatively affect the growth, recruitment and survival of lake whitefish.

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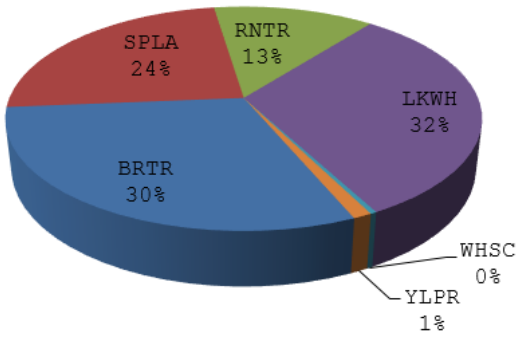
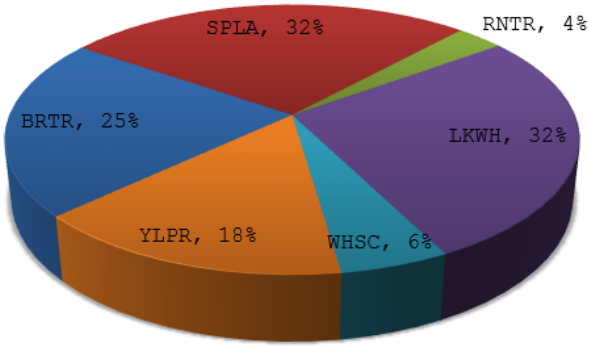
2010/11 BTIN Assessments:

In the summers of 2010/2011 SVSFE technical staff assessed Gull Lake trout stocking success through BTIN (Brook Trout Index Netting). BTIN is a fish community protocol developed in Ontario, and is designed to provide an unbiased index of brook trout abundance, as well as provide biological information on the target species (Please refer to Prj 10-11, and Prj 10-30 Stocked trout assessments). In accordance to this protocol, 30 randomly located gill nets (3 @ 15m panels of 2" and 2.5" mesh) in early July 2010. This exact program was replicated early July 2011 to further assess stocked trout success and compare efforts. Results are as follows:

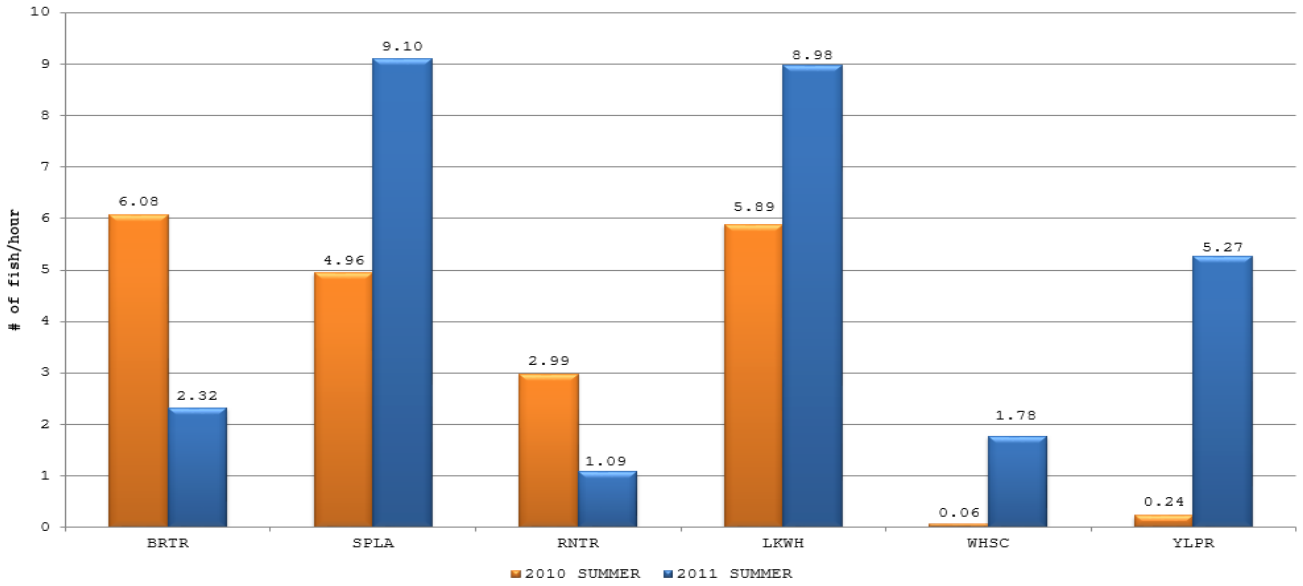
2010 Gull Lake Species Composition



2011 Gull Lake Species Composition



2010 – 2011 Gull Lake Catch per Unit Effort Comparison by Species



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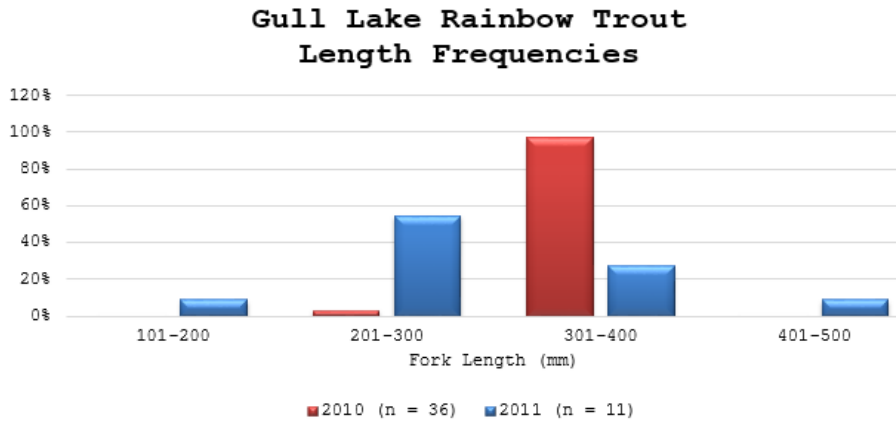

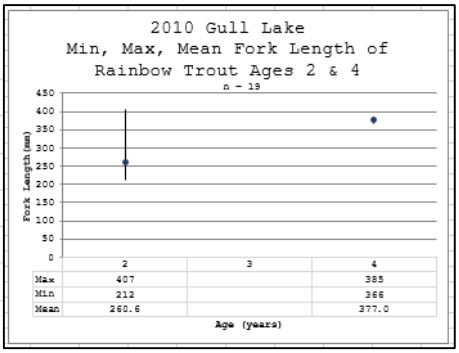

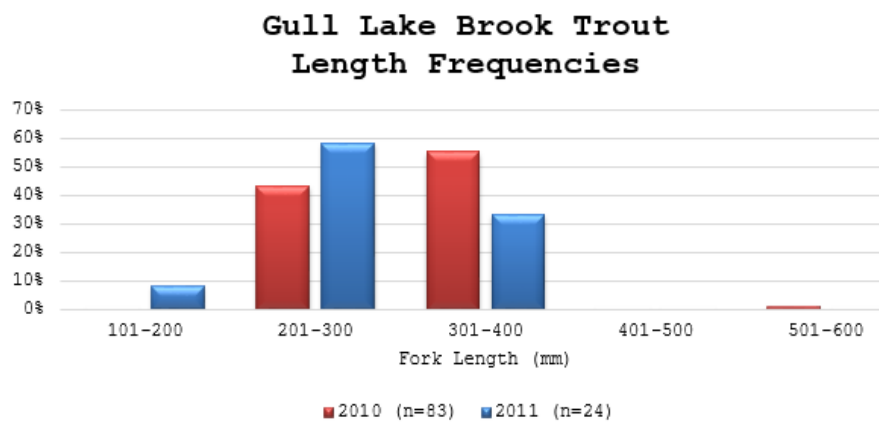

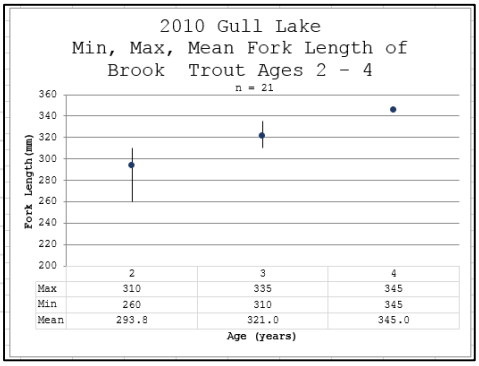

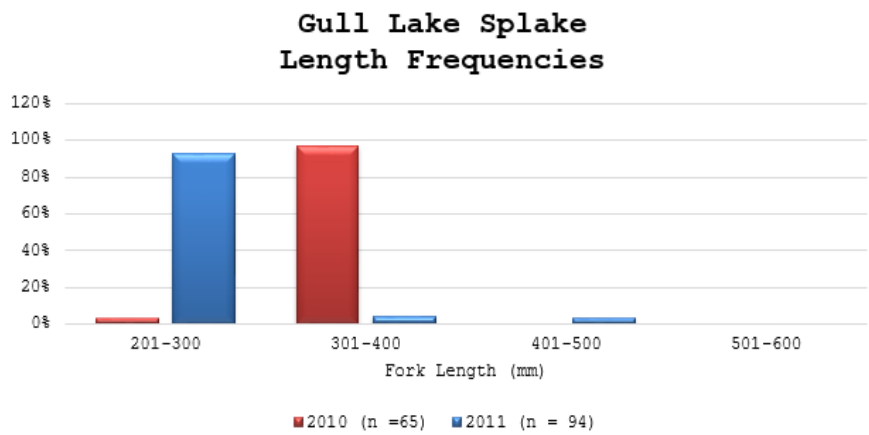

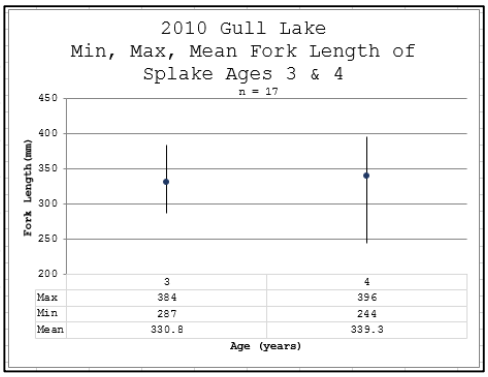

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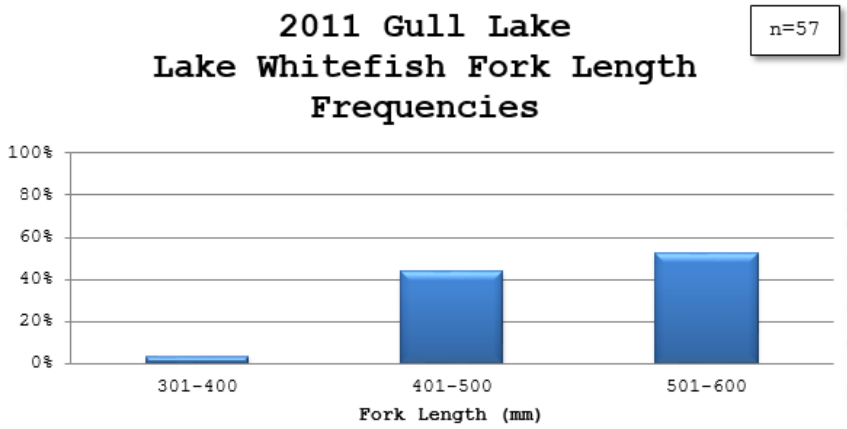
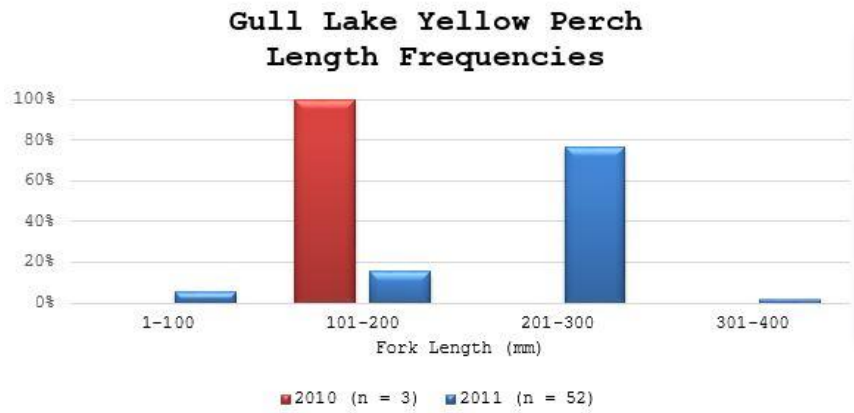
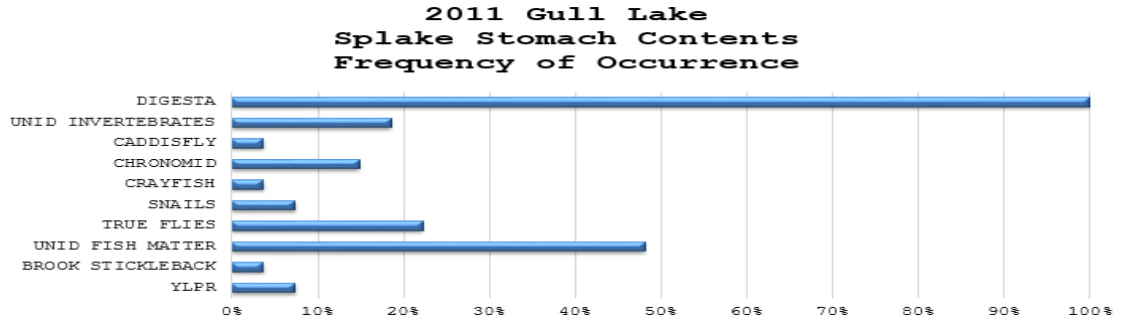




Stomach Content Analysis: Through 2011 BTIN, a total of twenty-seven splake, three rainbow trout, six yellow perch, and six brook trout were unintentionally killed during assessments. For sake of further data collection, stomachs were collected analyzed in order to (1) to determine if there was an overlap between trout and yellow perch feeding habits, and (2) to determine if splake were actively feeding on invasive yellow perch populations. Results from stomach content analysis is as follows:



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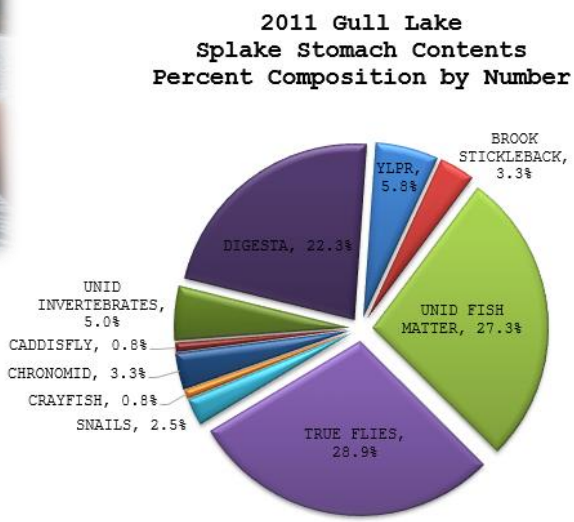

With regards to rainbow trout, brook trout, and yellow perch very little conclusions can be made; which is largely due small sample sizes collected (n=3, n=6, and n=6), respectively. Also for this reason, no visual representations of results were created, results for rainbow trout, brook trout and yellow perch are as follows: In terms of rainbows, chronomids made up a majority of the diet within this small sample size (n=3); also one individual appeared to be piscivorous as unidentified fish remains were found. This fish was 236mm (Fork Length). In terms of brook trout (n=6), a large variety of preferred forage was determined. Clams, crayfish, chronomids, water-mites, boatmen/back-striders, unidentified beetles, unidentified fish remains, and unidentified invertebrates were found in brook trout stomachs suggesting that brook trout were largely opportunistic within this sample size. One individual (218mm FL) was feeding on yellow perch. In terms of yellow perch (n=6) 4/6 stomachs were empty. One individual was actively feeding on snails, and the other was piscivorous, as unidentified fish remains were determined. In terms of splake the entire sample size (n=27) were from 2010 stocking which has an average length of 271mm FL. Interestingly two individuals were feeding on yellow perch, and thirteen had unidentified fish remains. This is interesting because splake at this size were primarily feeding on true flies (28.9% by number) and piscivorous (36.4% by number). In summary, this is of interest because it suggests that splake could be a good option for lowering perch numbers in Gull Lake, especially at these low length frequencies.

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BTIN Assessment cont'd: First of all, it is important to state that 2010 and 2011 BTIN assessment occurred within the short timeframe in which yellow perch were first identified in the waterbody. An analysis of results for each species through these assessments are as follows:

Rainbow Trout: In 2010, and 2011 rainbow trout species composition equated to 13% and 4% of total species composition, respectively over the two years. Also in terms of CPUE fish per hour dropped from 2.99 to 1.09 from 2010 to 2011. Regarding the specific timeline of this assessment, it could be evidence of declining stocked rainbow trout survival as a result of increased predation and competition from yellow perch. In 2010 a total of 31 rainbows were captured. Of this sample, there were two primary length frequencies (201-300mm and 301-400mm). Correlating with ages (subsample n=18) the average growth of a 2+ was 250mm, and the average growth of a 4+ was 377mm. In this subsample 15/18 (83%) were aged 2+ and 3/18 (16%) were aged 4+. Correlating with stocking records it can be determined that this high frequency of 2+ was a result of 2008 fall stocking (10,500 12-15cm). In this circumstance; 22 months after stocking, growth was on average 100mm or 4". Regarding the 4+ age class, this can be correlated to 2006 fall stocking (15,000 12-15cm 0+). The average growth after stocking equated to ~250mm or 10" in the 3.75 years following stocking.

Growth, at this point appears to be average for a benthic Duck Mountain stocked trout lake. In comparison to Two Mile, average growth for a 4+ is quite higher (318mm in Two Mile) and in comparison to a very productive aerated pothole such as Patterson Lake is average growth is much lower (average 4+ 421mm), as expected. In 2011, a much greater span of different length frequencies (and therefore ages) is noted, suggesting greater evidence of successful annual stocking practices. In summary, it is noticed that CPUE drops significantly from year to year. Also it is noted that master angler submissions appear to plummet following 2010 which interestingly correlates with yellow perch invasions. Currently there is evidence to believe that perch are negatively affecting rainbow trout stocking success, and at this point is something that should be further investigated.

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Brook Trout: In 2010, and 2011 brook trout species composition equated to 30% and 8% of total species composition, respectively over the two years. Also in terms of CPUE fish per hour dropped from 6.08 to 2.32 from 2010 to 2011. Because of the specific timeframe of this assessment, this could be evidence in declining stocked brook trout survival as a result of increased predation and competition from yellow perch. In 2010, a total of 21 brook trout were aged. Within this sample 14/21 (66%) were aged at 2+, 6/21 (28%) were aged at 3+, and 1/21 (0.04%) was aged at 4+. The 2+ stocking had an average length of 298mm and can be correlated to fall 2008 stocking (5,000 @ 12-15cm). The 3+ stocking had an average length of 321mm and can be correlated to fall 2007 stocking (5,000 fingerlings). The 4+ stocking had an average length of 345mm (n=1) and cannot be correlated with the documented stocking records. Average growth amongst these age frequencies is very similar to that of the rainbow trout, which shows average growth for benthic Duck Mountain Lakes. In 2011, a diversity in length frequencies is noted, suggesting greater evidence of successfully annual stocking practices. In summary, it is noticed that CPUE drops significantly from year to year. Also it is noted that master angler submissions appear to plummet following 2010 which interestingly correlates with yellow perch invasions. Currently there limited evidence to believe that perch are negatively affecting stocked brook trout success, and this is something that should be further investigated.

Splake: In 2010, and 2011 splake species composition equated to 24% and 32% of total species composition, respectively over the two years. Also in terms of CPUE fish per hour increased from 4.96 to 9.10 from 2010 to 2011. This change in CPUE can be directly related to a splake stocking of 6,000 18+ in the fall of 2010. Interestingly of this stocking, splake had an average length of 271mm. This suggests an average growth of 100mm (~4”) in 10 months after stocking. This also suggests a high survival rates of fall stocked splake. In 2010, a subsample of 17 splake were aged (6/17 3+ and 11/17 4+). Again, growth appears to be very similar to both brook trout and rainbow trout in this waterbody. The interesting concept here is the high CPUEs correlate with very low stockings of splake. In summary, it appears that splake stocking is more successful than rainbow and brook trout in this particular waterbody.

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Yellow Perch: In 2010, and 2011 yellow perch species composition equated to 1% and 18% of total species composition, respectively over the two years. Also in terms of CPUE fish per hour increased from 0.24 to 5.27 from 2010 to 2011. Interestingly, this assessment was completed within the timeline of perch introductions, and displays strong evidence of significant recruitment and survival of yellow perch. Following 2010 and 2011 assessments all that can be concluded is that perch populations should be closely monitored because in multiple other instances; perch invasions have seriously impacted the stocking success of hatchery-reared salmonids.

Lake Whitefish: In 2010, and 2011 lake whitefish species composition remained the same (32% of total species composition) over the two years. Also in terms of CPUE fish per hour increased from 0.06 to 1.78 from 2010 to 2011. Lake Whitefish have extremely sensitive mouths and gills and are not very receptive to short-set gill netting. For this reason, in order to avoid fish stress and mortalities, whitefish were quickly released in 2010. In 2011, a sample size was measured and released. Fish were not aged, tagged, or weighed to avoid fish stress. In terms of 2011 length frequencies, a wide range is noted suggesting that successful growth and recruitment is occurring. Also a relatively high percentage, (35/57 or 61%) of the sample were designated master angler sized fish for those trophy anglers who regularly visit Gull Lake to take advantage of it's trophy whitefish population. With regards to the master angler database, is appears that submissions appear to be on a downward trend from 2013 onwards. Though in 2016, multiple fly anglers expressed that whitefish angling was exceptional in September and October (Koutecky, 2016). At this point in time, yellow perch are not believed to be affecting lake whitefish growth, survival and recruitment. Regardless this is a phenomena that should be closely monitored.

BTIN Summary: In conclusion, between 2010 and 2011 assessments some very interesting trends can be noted. First of all yellow perch were beginning to show increased growth and recruitment. In terms of both brook trout and rainbow trout it was noticed that both CPUEs and species compositions had dropped significantly in such a short period of time. In terms of historical and current master angler submissions, there have been significant decreases in recent years closely correlating with perch invasions. When shifting focus to stomach contents, not too much can be determined largely due to the fact that sample sizes were significantly low, however there is evidence that splake are actively feeding on perch (starting at low length frequencies). In summary, the recent invasion of yellow perch invasions should be closely monitored as they appear to be negatively affecting stocked trout success.

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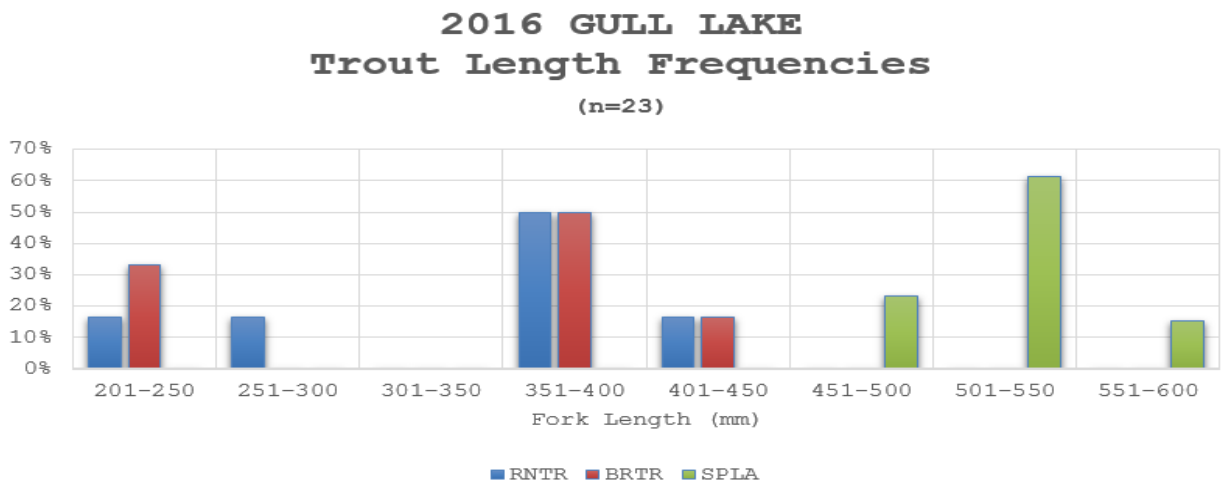
2016 Assessments: As stated above, in the 2016 open water season SVSFE set out to (1) further quantify these perch invasions (2) remove as many non-salmonid species during assessments as possible, and (3) come up with a constructive, yet economically viable management plan for Gull Lake. This program was initiated because of reasonable evidence suggesting that yellow perch invasion have compromised trout stocking success in recent years.

Beginning in early June 2016, Gull Lake was assessed and perch were removed using electrofishing as the primary method. Fishing took place in areas/habitats where yellow perch were considered to be. In total two hours of fishing effort was achieved and 1358 yellow perch, and four white suckers were captured and removed; six brook trout were captured, sampled and released. In late August, trap-netting was utilized to further assess Gull Lake. In total 136 hours of fishing was achieved (6 nets). In total, 867 yellow perch and 182 white suckers were capture and removed; six brook trout, six rainbow trout, and eleven splake were captured sampled and released. Results are as follows:

Lake	Date	Method	Water Temp (°C)	Effort (hours)	Catch				
					YLPR	WHSC	BRTR	RNTR	SPLA
Gull Lake	Early June	Electrofishing	NA	1.5 -2.0 (two short evenings)	1358	4	6	0	0
	Late August	Trap Netting	15	136 (6 trap nets)	867	182	6	6	11
biomass of yellow perch removed = 37,240 g (transferred to Childs) and suckers = 77,600 g (repurposed)									



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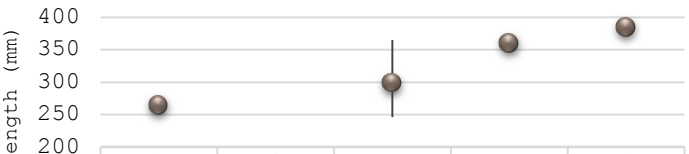
2016 Assessments cont'd: When analyzing growth from the 2016 collection, only a small sample was efficiently aged, producing sample sizes of n = 5, 6 & 7 for brook, rainbow and splake respectively. It is difficult to draw conclusions but there are similar trends within the limited sample.

In terms of stocking success of rainbow trout, it is difficult to develop any conclusions as stocking practices included different sized fish, in different seasons within a short period (2 years). Four year old rainbow trout were of the highest frequency but could be the result of three different plantings surrounding 2012. Growth, at this point appears to be similar in initial years, but lower in fish when compared to 2010 results. Today 2+ rainbow was 265 mm (250mm in 2010) and a 4+ rainbow averaged 299 mm (377mm in 2010). Furthermore, rainbows did not reach master angler size by age six. For comparison, through 2016 age analysis, average growth of 5+ rainbow was 478 mm and 485 mm in West Goose (n=1) and East Blue (n=16), respectively.

2016 Gull Lake
Rainbow Trout Min, Max, Mean

n = 6



	2	3	4	5	6
Min	265		246	356	385
Max	265		365	365	385
Mean	265		299.5	360.5	385

Age (years)

When evaluating brook trout growth, fish at age four were slightly bigger than the results from 2010. 2016 4+ is 409 mm, where in 2010 a 4+ was 345 mm. The higher frequency of age 4+ brook trout is likely a result from the 5,000 18+cm fish stocked in 2014. in summary, growth appears to be average, however survival rates require further investigation.

In terms of splake, noted is considerable growth and survival when referencing stocking records. Again, it appears that splake stocking is more successful (regardless of stocking size) than rainbow and brook trout in this particular waterbody.

2016 Gull Lake
Brook Trout Min, Max, Mean

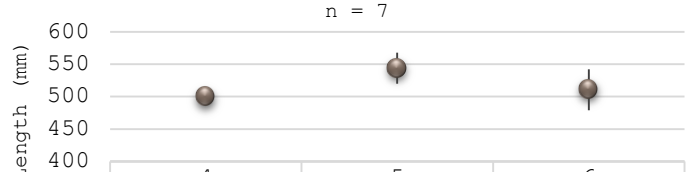
n = 5

	1	2	3	4
Min	213		371	373
max	235		371	446
Mean	224		371	409.5

Age (years)

2016 Gull Lake
Splake Min, Max, Mean

n = 7



	4	5	6
Min	500	520	479
max	500	568	542
Mean	500	544	511.5

Age (years)

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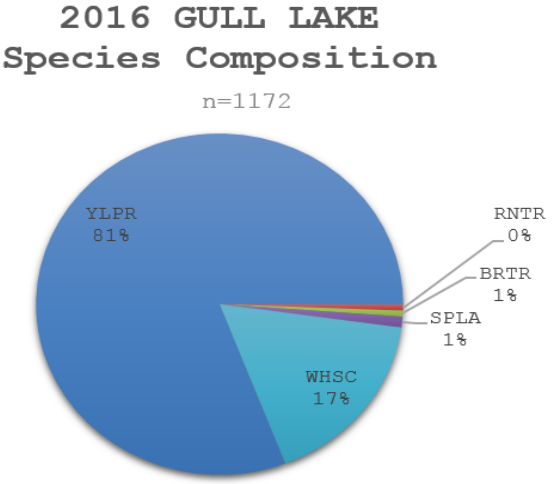

Results cont'd: With regards to species composition; results indicated that 81% yellow perch, 17% white sucker, 1% brook trout, 1% splake, and 0% rainbow trout. The brief electrofishing and trap-netting assessments may not be the most effective methods for quantifying trout stocking success. At this point it becomes important to state that 2016 efforts are not lake representative (especially in terms of total species composition); primarily because efforts were targeting yellow perch in littoral and near-shore habitats.

In terms of preferred habitat, spring electrofishing displayed high perch catches to be associated with (1) beaver activity and high percentages of woody debris (2) shallow bays with chara and pondweed as the dominant vegetation, and (3) the windward shore(s). Aside from this no real highly productive areas were determined. Late summer/early fall trap netting seemed to be more effective in capturing larger, mature sized perch. In terms of most productive areas, transitional habitats from dense chara to hard packed sand and rock were the most effective. For example, the two best perch CPUE sites were (1) perch bay, and (2) on the east side of camp island. Both sites have abundant green vegetation (chara), and nearby rock structures.

In summary, these short experimental assessments were reasonably cost effective and determined specific locations and habitat types to effectively remove perch, though further methods/analysis should be considered. Perhaps different efforts in a greater variety of habitats and times of year would have determined more significant results in terms of quantifying; non-salmonid invasions, stocked trout survival and health, as well as efficient removal practices.

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Discussion/Recommendations: In 2008, the Province of Alberta released a document entitled "Fisheries Management Branch Response to Unwanted Perch Populations in Stocked-Trout Lakes in Alberta" (FMB, 2008). This document essentially lays out different management options for different types of non-salmonid (i.e. yellow perch) invasions. It identifies three different perch invasion scenarios, and different options on how to deal with them. For further reading please refer to literature cited of this report for link to referred document. SVSFE has utilized this thought process to develop management options specific to our area. At this point please refer to a draft document entitled "SVSFE's Management for Unwanted Perch into Stocked Trout Lakes". This document is designed to provide a step by step approach to dealing non-salmonid (yellow perch) invasions in stocked trout waters.(Appendix)

Step 1: Quantify the problem - At current it appears the Gull Lake exhibits a strong rate of non-trout invasion by yellow perch. SVSFE has noticed a demand to truly quantifying problems of this nature; and because of this we are in the works of creating a "standard protocol for assessing still-water stocked trout waters". This non-lethal program will be designed and agreed up by the scientific community. At this point in time (2016), regardless of true scientific backing, we can assume that the perch in Gull Lake should not be overlooked.

Step 2: Stakeholder Meetings: At this point, it becomes important for stakeholders to go over the data and discuss the options. Drawdown and ceasing aerations is not an option here. Chemical Rehabilitation is not an option here, considering the lake whitefish population and the current trout investments. This meeting should review the possibilities available.

Step 3: Review Options- Based on current management plans for Gull Lake, one could assume changing the management plan to a perch fishery and walking away is not an option. Currently, there are four potential options which could be attempted, or combined for effectiveness.

(1) Stocking Rate: In terms of stocking rates and frequency, one should determine if current stocking practices are efficient; how do trout ages and length frequencies correlate with current status of trout in the lake and what seems to be working and what does not; time of year and stocking size should be closely examined in this process. In terms of appropriate stocking densities, it has been noticed that every managerial jurisdiction across the board has a different approach; where some densities work, some don't, and in many cases the success rates from jurisdiction to jurisdiction contradict each other. For this reason, it is suggested that stocking rate be further discussed amongst stakeholders, as it is believed that efficient stocking rates are very lake specific, especially when competitive and predatory species inhabit the lake. Regardless, the current rainbow trout and brook trout stocking practices in Gull Lake can be hypothesised as being affected by perch populations, and changes should be considered.

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(2) Stocking Size: In terms of stocking size, a strong argument is that larger fish are quicker and easily escape predation, as well as compete better. In 1959, Crossman, found that rainbows switched from a plankton to shiners at >250mm (Crossman et, el 1959). In Arizona, researchers found that rainbows <300mm fed predominantly on plankton before switching to a piscivorous diet (Otte, 1975). Beauchamp, 1990 found that rainbows switched from invertebrates to small bodied fish at a length of 250mm (Beauchamp, 1990). This is noted because at this point stocking on top of perch populations is unavoidable and stocking practices should be experimented with. In this case, stocking larger trout (specifically rainbows) will improve chances of reaching length frequencies where they will switch to a piscivorous diet, compete less with perch for invertebrates and plankton, and potentially even feed on young yellow perch. In Lake Washington, WA, researchers found that in spring and summer yellow perch were an important forage base for rainbow trout >250mm (10") (Beauchamp, 1990). "In Saskatchewan, a couple lakes with perch we are planning on stocking larger trout (8-10 inches compared to 2-3 inches) at a reduced stocking rate (1/2 to 2/3 the regular rate) with the hope that the larger stocked trout will better compete with the perch. This was the first year this was tried and only in one lake so far, so we do not have any results yet" (Prestie, 2016). In general, the larger the trout is at the time of stocking, the greater chance it will have to reach sizes that will attract anglers in a system containing yellow perch.

(3) Stocking Species: To consider stocking another species. From recent and historical records, splake have done exceptionally well in the lake and there has been evidence of splake actively feeding on yellow perch populations. Unfortunately, at this time, splake are not being produced within the hatchery. Future production is dependant on mandatory disease testing of lake trout and time associated with consecutive clear results and time to produce fish to stocking size. For this reason, splake stocking has not occurred since 2010. The province of Saskatchewan found that rainbow and brook trout do not compete well with perch. "The only lakes that have maintained a decent trout fishery after the establishment of perch are lakes stocked with brown trout, tiger trout, or splake" (Prestie, 2016). In Goong Reservoir, Australia, triploid brown trout stocking was ceased do to substantial impacts and predation on Macquarie Perch (FRDR, 2016). Macquarie Perch (macquaria australasica) are not related to yellow perch, however, it has been suggested by Friends of the Red Deer River community organization of Alberta, that triploid browns may be able to control the perch problem in Cow Lake, Alberta.

If altering stocking rates, stocking size, or species stocked, it becomes imperative that full communication be made between stakeholders, provincial fisheries staff, and Manitoba's fish stocking program. As we know, the Whiteshell Hatchery plans stocking years in advance, so if changing the stocking program becomes priority, it may take a few years to become implemented.

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(4) Manual Rehabilitation - Evaluate the cost and benefits of initiating a manual non-salmonid fish-out program. As we know, this is difficult to quantify, as manual removals can require significant effort, differ from lake to lake, are expensive, and only temporary. In terms of Gull Lake, when evaluating the cost-benefit of manual lake reclamation, degree of invasion, size of waterbody, available methods, gear and manpower are all factors that can effect whether it is economically viable to remove perch. The hard part here, is truly understanding the cost-and-benefits associated with reclaiming a lake.

According to a non-salmonid (northern pike) removal program in West Long Lake, Nebraska they state that mechanical fish removal is only recommended on small bodies of water where sufficient effort can be put forth to remove enough fish to achieve management goals (Jolley et el, 2008). Also, they state that efforts are extremely unlikely to remove all individuals, are only temporary because the juveniles that remain will display compensatory increases in recruitment, survival and growth. Also note that cropping perch populations may lead to decreased interspecific competition and increased growth of perch. Therefore, mechanical removal programs should be comprehensive and long term. The Alberta response plan (FMB, 2008) states that if yellow perch density increases to 25% or more of species composition that the perch are considered to be adversely affecting the trout stocking program. The authors suggest that if feasible, work with clubs and volunteers to control perch numbers of recruitment by manual removal of eggs and fish, by keeping perch densities <25% of total species composition. If this objective is achievable, trout stocking should continue as necessary.

Another example is from Cow Lake, Alberta. Rainbow trout stocking began in 1982 and provided anglers with a trophy rainbow trout destination for over 10 years when in 1993, the illegal presence of yellow perch was confirmed. Since then the yellow perch population exploded and trout fishing quality declined to the point where it was not economically viable to stock trout anymore. The idea of conducting removal programs were considered, however the idea was tabled because it was determined that a substantial cost (over one million dollars) combined with lack of confidence in success due to physical characteristics of the lake (AB Gov, 2014). Upon further investigation Cow Lake is a total size of 856 ha, at $1,000,000 to effectively remove perch equates to $1,156 per hectare. For comparative reasons, Gull Lake is 116 ha, meaning at this rate it could cost $134,000 to "effectively" manually remove perch. It is unknown how Alberta came up with this figure or methods/timelines for removals so for that reason, to move forward, SVSFE needs to quantify the potential cost of reclaiming Gull Lake through manual rehabilitation and the degree of success in this method.

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Options on How to Proceed:

1) Is there enough evidence to initiate changing the management plan?

Yes? Proceed to Step 2

No/Unknown? Develop a standard assessment protocol to further evaluate stocking success in the summer of 2017 – review results in late 2017

2) What type of fishery should Gull Lake be?

Trophy Trout Fishery – Change the lake regulation – Limit of 1 or 0, and protect trophy fish, also initiate tackle restrictions. Arguably trophy sized trout will be piscivorous and will predate on yellow perch populations.

Put and Take Fishery – Leave regulations the same

Combination – Leave regulations the same

3) What is the desired species?

Brook Trout – perch are negatively affecting brook trout stocking success. Experiment with stocking larger fish at lower stocking rates.

Rainbow Trout – perch are negatively affecting rainbow trout stocking success. Experiment with stocking larger fish at lower stocking rates.

Splake **–** Significant evidence that splake stocking on top of perch populations is successful and feed on perch. Note that it could be up to 3-4 years before the hatchery will have splake stock – consider finding and paying for stock elsewhere. Note that (Fraser, 1988) found that splake actively prey on recently stocked rainbow trout and that (Burkard, 1962) found that rainbow trout and splake feeding habits overlap considerably in the spring, summer and fall.

Other Species **–** Experiment with tiger trout, or brown trout. These species have had success stocking on top of perch populations in the Province of Saskatchewan.

4) Consider Manual Rehabilitation

Further investigate if manual removal programs specific to Gull Lake are cost-effective and whether objectives are achievable. Either 1) combining perch removal in conjunction with the agreed upon standard stocked trout assessment or 2) have volunteers carry out removals would be lower costs of conducting individual removal programs. Although these options provide lower costs, the feasibility of their success is likely low as these are only short term goals and manual removal requires long term commitments. Without long term commitments and with the current status of the perch population and their ability to reproduce and out compete trout, manual rehabilitation is only “treading water” (Brock 2016).

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Notes for SVSFE technicians:

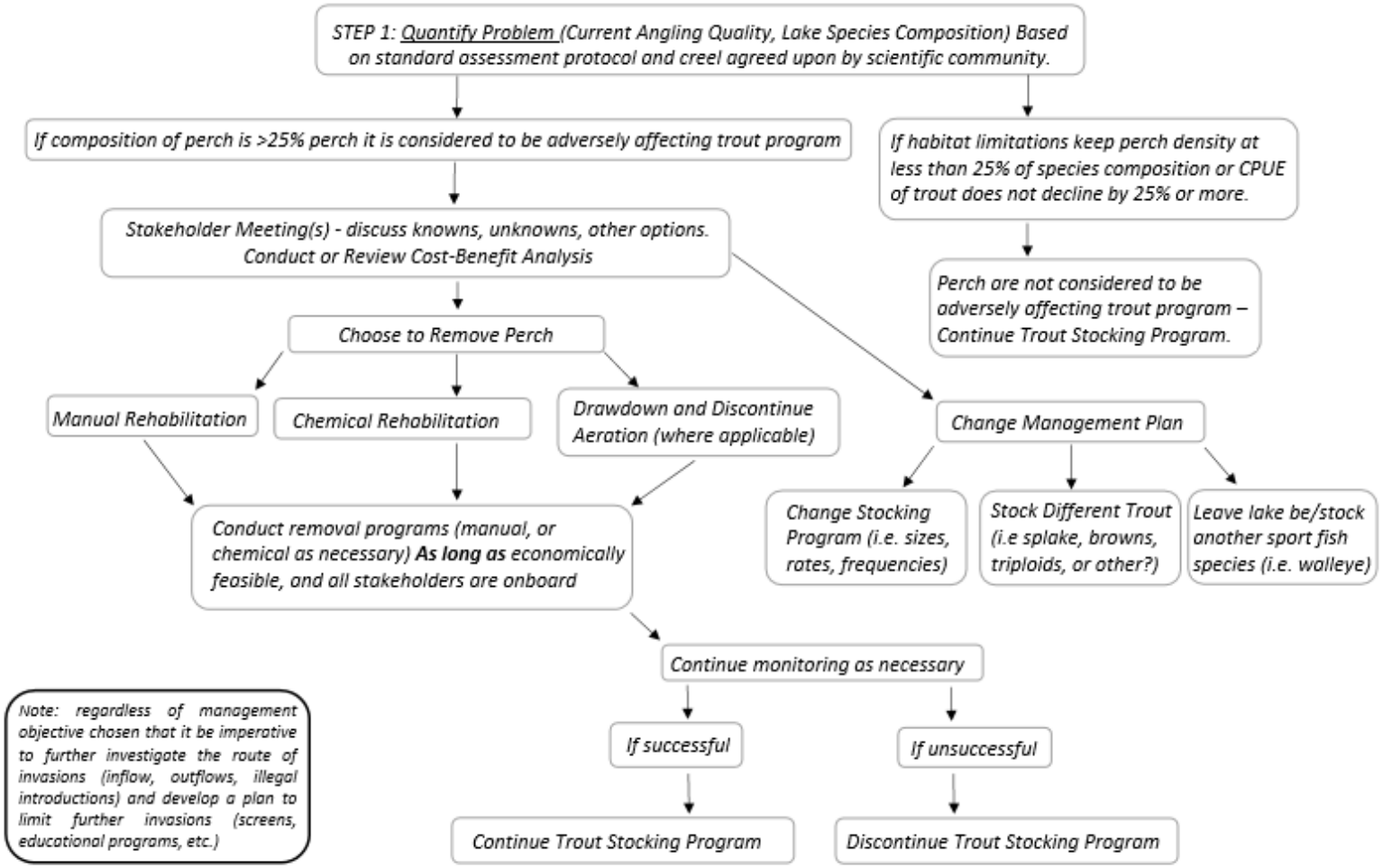
(1) *Develop a standard stocked-trout assessment protocol using non-lethal methods for future analysis of stocked trout waterbodies containing adverse non-salmonid presence. Work with the scientific community to ensure that this program will paint a true picture of stocked trout success and species compositions*

(2) *Discuss with local Fisheries Biologist, Ian Kitch and Hatchery Manager, Kevin Dyck to determine possibilities and timelines in changing stock size to larger trout (specifically rainbow trout) to increase stocking success and angling quality in a perch invaded waterbodies.*

(3) *If recommended by stakeholders, further investigate the concept of manual rehabilitation programs and determine if a program of this magnitude is economically viable.*

Appendix

SVSFE Management Options for Unwanted Perch into Stocked Trout Lakes



Literature Cited: Fisheries Management Branch Response to Unwanted Occurrences of Perch in Stocked-Trout Lakes in Alberta, 2008

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