Regulation Proposal Form

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Proposal Title	
Lake Nebagamon Walleye Fishery Initiative	
Author	**Date**
Scott Toshner	6/8/2011

Location Information:

Affected water(s)	
Lake Nebagamon	
County	**WBIC(s)**
Douglas	2865000
Upstream/downstream boundaries, if applicable—Law Enforcement should be consulted	
Lake Nebagamon not including any tributaries or outlet	
Will this regulation affect Ceded Territory water and are there any anticipated impacts to tribal fisheries?	
Yes ☒ **No** ☐	

Current Regulation

15 inch minimum length and 5 fish daily bag limit. Usually a 2 fish daily bag limit due to tribal declarations, however in several years it reverted to a 3 fish daily bag limit.

Proposed Regulation

18 inch minimum length limit 3 fish daily bag limit.

Management Goal

Summary statement that characterizes the desired fishery (e.g. provide a naturally reproducing harvest-oriented walleye fishery; provide a bass fishery dominated by large adults that maximizes predation on smaller fishes)

To increase the walleye population (by stocking walleye of most cost effective size), size structure of the walleye population (by changing the walleye regulation) and fish habitat (by restoring buffers and woody structures).

Description of the Water(s) and Fishery

Provide a brief description of the water(s), past regulations and other management actions. Summarize all applicable fisheries data, particularly from surveys meeting protocols (Table 1).

Lake Nebagamon is a 914 acre drainage lake located in northeastern Douglas County, approximately 30 miles east of the cities of Superior and Duluth, MN. Major inlets to the lake include Minnesuing Creek and an unnamed tributary draining Steele and Little Steele Lake. Water exiting the lake eventually flows into Lake Superior through Nebagamon Creek and the Bois Brule River. Much of the lake's 41 sq mile watershed is forested and privately owned.

Lake Nebagamon has a maximum and mean depth of 56 and 20 ft, respectively. Water quality and clarity are fair and generally reflective of the lake's mesotrophic status. Chlorophyll-a and total phosphorous average 3.8 ug/l and 18.4ug/l, respectively (Self Help Monitoring 2005). The water is stained and subject to periodic algae blooms. Mid- summer secchi depths average 8 ft but seldom exceed depths of 10 ft or more. Littoral substrates are predominately sand and macrophytes are common. Located near the region's largest metropolitan areas, much of the lake's 10.8 miles of shoreline is developed.

Fisheries management activities have largely focused on periodic surveys, stocking, and habitat management. The first recorded lake survey occurred in 1936. In addition to an abundance of habitat from macrophytes and fallen trees, investigators at the time noted the lake's typically good water clarity was periodically reduced by algae blooms (Anonymous 1936). Periodic surveys from 1956 - 1974 found fish communities dominated by walleye, northern pike, smallmouth bass, yellow perch, black crappie and white sucker. Surveys since 1986 have largely entailed comprehensive assessments of walleye and northern pike.

Stockings dating back to 1934 have been varied. Annual stockings of walleye from 1934 – 1963 were

discontinued after a 1963 survey deemed continued stocking unnecessary. Walleye stockings resumed after a 1986 survey found below average walleye abundance. Although a subsequent assessment in 1994 suggested large fingerling stockings contributed to higher walleye abundance, abundance remained below management objectives of 3 adult walleye/acre. These findings prompted an expansion of stocking to include stockings of walleye fry in Minnesuing Creek, a tributary historically known to support significant spawning migrations of walleye from Lake Nebagamon.

Habitat improvement efforts have primarily focused on the enhancement of walleye reproduction. In-lake spawning reefs were constructed in 1998 and 1999 and intensive beaver control was initiated in 1998 to insure free passage of walleye to high quality spawning habitats in Minnesuing Creek. Excluding walleye, sport harvest has been largely managed through statewide length and bag restrictions. Allocation of the mixed fishery is accomplished via spear quotas derived from annually adjusted safe harvest levels and corresponding angler bag limit reductions. Angler bag limits since the onset of the tribal fishery in 1989 have largely ranged between two or three walleye per day. A 15 inch minimum length limit on walleye has been in effect since 1990.

Walleye. Estimated abundance of adult walleye in all years suggests Lake Nebagamon supports a low density walleye population. Walleye density was the highest in 1992 (3.2 adults/acre), 6 years after the initiation of stocking in 1986. Walleye density in 2005 however, was similar to pre-stocking densities despite nearly 2 decades of near annual walleye stockings (2005 = 1.3 adults/acre, 1986 = 1.5 adults/acre; Figure 1). Walleye density in all years was below management objectives of 3 adults/acre in all years except 1992. Relative to other ceded territory lakes, adult density in Lake Nebagamon (mean = 2.0 adults/acre, N = 6, SD = 0.72) has been less than lakes supported primarily through natural reproduction (mean = 3.9 adults/acre, N = 357, SD = 2.47) and similar to lakes supported primarily through stocking (mean = 1.9 adults/acre, N = 143, SD = 1.83).

Size structure of adult walleye was good but variable. Legal length walleye (≥15 in) comprised more than half the adult stock in all years and size structure shifted towards increasingly larger walleye between 1986 and 1998 ($D = 0.15$, $P < 0.01$). PSD increased from 61 in 1986 to 65 and 72 in 1994 and 1998, respectively. PSD in 2005 declined to 54 and size structure overall was not significantly different from 1986 ($D = 0.07$ $P = 0.15$). Two-fold increases in the abundance of walleye between 15 – 20 in were primarily responsible for larger size structures in 1994 and 1998. In all years, walleye ≥ 20 in were sparse and accounted for less than 12% of the adult stock. With the exception of higher abundances of small walleye in 1994, abundance of sublegal (≤15 in) walleye was stable (Figure 2).

In all years, male and female walleye initiated maturity at age 3 and age 4, respectively. Although walleye ages 4 - 6 accounted for more than half the adult stock in all years, recruitment was variable (Figure 3). Age 4 and age 5 walleye comprised 56% of the adult stock in 1986 whereas the strong cohorts of age 5 and age 6 walleye comprised 71% of the adult stock in 1994. Comparatively weak cohorts of age 3 – 6 walleye comprised 74% of the adult stock in 2005. Overall, age structure shifted towards younger age walleye. Walleye age 10 and older declined from 11% of the adult stock in 1986 to 4% of the adult stock in 2005. Average age of adult walleye over the same time period declined significantly ($t = 4.84$, $df = 937$, $P < 0.001$). Average age of adult walleye in 1986 and 2005 was 6.2 and 5.4 years, respectively (1986, N = 527, SD = 2.68; 2005, N = 412, SD = 2.00).

The effect of stocking on adult cohorts was mixed. Strong and weak cohorts stemmed from both stocked and non-stocked year classes. Although large fingerling stocked in 1989 contributed 25% to the strong age 5 cohort in 1994 (Sand 1994), no stocking occurred in the year that produced the strong age 4 cohort in 1998. Conversely, a majority of the adult stock in 2005 consisted of relatively weak cohorts supplemented by stocking (Figure 3).

Walleye growth across years was variable and dimorphic. In most years, male walleye attained legal harvestable length (15 in) at age 5. In all years, females attained legal harvestable length by age 4 and on average, were larger than males at any given age. Disparate growth between sexes became increasingly noticeable with age. By gender, the largest walleye sampled were a 22.1 in (age 16) male captured in 1986 and a 27.8 in (age 14) female captured in 1994. Across years growth of both sexes was similar to the regional average, however male walleye tended to grow slowly after age 10 (Figure 4).

Fall electrofishing surveys from 1986 - 2006 indicate abundance of age-0 walleye was variable in both stocked and non-stocked years (Table 2). Relative abundance of age-0 walleye in stocked years ranged from

2.8 – 40.1 fish/mile. Natural reproduction occurred in all non-stocked years. Relative abundance of age-0 walleye in non-stocked years ranged from 0.8 – 28.9 fish/mile. Although on average the relative abundance of age-0 walleye in stocked years (mean = 19.7 fish/mile, N = 14, SD = 12.95) was 38% higher than non-stocked years (mean = 14.3 fish/mile, N = 4, SD = 12.45), differences were not significant (t = 0.74, df = 16, P = 0.47). Relative abundance of age-0 walleye in both stocked and non-stocked years was generally low, exceeding the ceded territory average for self sustaining lakes (≥ 33 age-0/mi) about once every seven years (Figure 6).

Survival of fry and fingerling (small and large) stockings was generally poor (Table 3). Survival appeared positively related to size at stocking with September stockings of large fingerling exhibiting a higher survival to the following May (6.9%) than June stockings of small fingerling (2.1%) and May stockings of fry (0.3%) to the following September. Survival rate had little effect on contribution, however. Contributions of small and large fingerling stockings were similar (19 - 21%) whereas the largest contribution (26%) resulted from fry stockings in Minnesuing Creek. Assuming stocked fry and small fingerling experienced the high overwinter mortality of large fingerling, fewer than 120 progeny from either stocking likely survived to age-1.

Management Objective(s)

a) Goals are general, objectives are specific. Objectives are used to evaluate the effectiveness of your action and determine if you have achieved your goal. Provide a management objective that is specific, measurable, able to be achieved, related to the goal, and has a temporal component (e.g. increase walleye harvest rate to 0.1 fish/hour while maintaining recruitment at or above 10 YOY/mile within 5 years; increase largemouth bass RSD14 to 35 and bluegill RSD8 to 15 within 5 years

In 2005, 12% of the adult walleye population was over 20 inches in length; a reasonable goal for the implementation of an 18 inch minimum regulation would be to increase that to 20% or more in ten years.

Increase the walleye abundance from 1.3 fish/acre to 3 fish/acre by stocking extended growth (6-8”) walleyes, starting in 2012. Potential sources of EG walleye are private sources (funded by lake association), tribal and state hatcheries. Extended growth walleye stocked in 1989 in Lake Nebagamon contributed 25% to the strong age 5 cohort in 1994, which is evidence that extended growth walleye stocking can be effective. Statewide management objective for walleye populations is 3 adult walleye/acre. Survey data from 2005 show Lake Nebagamon has 1.3 adult walleye/acre. A reasonable goal is 3 adult walleye/acre, since in 1992 Nebagamon supported a population of 3.2 adult walleye/acre. The current thinking is that it will take 4 to 5 stocking events to exhibit discernable results in walleye abundance. If after 4 or 5 stocking events fisheries surveys data will determine whether or not walleye abundance has increased to 3 adult walleye/acre. Survey results will help decide management techniques and objectives.

b) Describe how the management objective and associated target levels for metrics were developed (e.g. lake management plan, stakeholder meeting, comparison to other water(s)).

The Lake Nebagamon Association and other members of the angling public came to Brule fisheries mangement with a desire to improve walleye fishing. Management objectives were developed using historic data from Lake Nebagamon and statewide management goals in conjunction and agreement with the Lake Nembagmon Association and the Village of Lake Nebagamon. Both the Lake Assocation and Village Boards voted unanimously to support this multifaceted approach (see attachment). The fisheries initiative has been developed and presented over the past 2 years and has 3 main components. 1). Increase abndance of walleye through EG walleye stocking. 2) Increase walleye size structure and natural recruitment through regulation change. 3. Improve fish habitat through shoreline and woody habitat restoration. Full initiative is attached.

Tribal Impact- Since 1989, spear harvests of walleye ranged from a low of 8 in 2005 to a high of 223 in 2004 and on average, significant harvests (>100) occurred about once every three years. If the initiatives objectives are met and walleye abundacnes increase, the tribe stands to benefit from potentially higher harvests whiles still maintaining safe harvest levels for Lake Nebagamon.

Current Problem

Use survey data or provide context for a similar water or group of waters (e.g. lake type, watershed) to demonstrate how the fishery is not meeting the desired management objective. Identify hypothesized problem(s) you hope to address.

Walleye abundance has declined (Figure 1, attachement). The average percent harvest by anglers for all creel surveys was nearly 60% for walleye from 15.0 to 19.9. Recruitment overfishing may be limiting natural recruitment due to the concentration of harvest on larger walleye. By making the walleye regulation more restrictive, stocking extended growth walleye fingerling and restoring nearshore and littoral woody habitat we

hope to increase walleye abundance, size structure and natural recruitment to historic levels.

Proposed Regulation Justification

How is the regulation change expected to meet your objective(s)? Demonstrate expected results of the regulation using tools such as modeling, comparisons to other waters, peer-reviewed literature, etc...

Research literature show more restrictive size regulations does not increase abundance (number of walleyes in the lake), but it may increase size structure (the average length and length frequency of walleye in the lake). In 2005, 12% of the adult walleye population was over 20 inches in length; a reasonable goal for the implementation of an 18 inch minimum regulation would be to increase that to 20% or more. If after 10 years, fishery surveys show this goal was not met, consideration should be given to changing the regulation back to a 15 inch minimum length.

Evaluation Plan

Provide a suggested plan and timeline for evaluating whether the objectives are met in response to the regulation change. Indicate potential courses of action if objectives are not being met. If proposed regulation is not part of the "toolbox" (Table 2) the evaluation plan needs to be additionally detailed with an explanation of how the costs of evaluation will be covered.

Lake Nebagamon is scheduled for a survey in 2013 as part of the baseline lakes monitoring program. Spring fyke netting and EF1 run would be used to calculate a population estimate and EF 2 run would also be completed to assess bass abundance as well as identify any large fingerling walleye that were stocked in the previous fall, if that occurs. Any extended growth walleye stocking would use marked fish and be evaluated the following spring. Lake Nebagamon is a "high priority" lake so would be on a 6 year rotation so it would also be surveyed under those protocol in 2019. Lake Nebagamon is also part of the treaty rotation schedule, but that schedule only goes out to 2013 so it is not known when the lake would again be evaluated under the treaty protocol. While extended growth walleye stocking is the primary initiative we may consider evaluation of fry stocking (marked with OTC) at some point unless survey information in 2013 EF2 and subsequent surveys shows high abundance of largemouth bass which appear to greatly limit survival of stocked walleye at sizes other than extended growth.

Previous Action

Include details on previous regulation proposals that were intended to address the current problem, if applicable.

Walleye regulation changes have been considered due to apparent evidence of recruitment overfishing but never acted upon.

Public Participation in Developing Proposed Regulation

Was input solicited from stakeholders when developing the proposed regulation change? Include documented comments from affected user groups (positive and negative), contacts made with local Conservation Congress Representatives, lake associations, angler groups, etc…

Public participation has been ongoing for the fishery initiative that has been developed. Working with the Lake Association and interested anglers the WDNR helped develop a initiative of which one of the objectives was to change the walleye regulation from a 15 inch minimum size 5/bag to a 18 inch minimum size 3/bag. The initiative and the lake association and village boards support of the initiative are in the attachments. This regulation proposal was discussed with Roger Wilson (Conservation Congress Delegate for Douglas County) who supported the change.

Small Business and Fiscal Effect

Explain who is likely to be economically impacted and in what way. If possible, provide estimates.

If the objective of increasing the abundance of walleye is met it stands to reason more anglers would come to Lake Nebagamon to fish. Which then could be economically beneficial to local business in the area. Estimating the benefit is not possible with the information I have access to.

Draft Question: for inclusion in Spring Hearing questionnaire

This proposal would (insert proposed regulation): Change the existing walleye regulation on Lake Nebagamon from a 15 inch minimum length and daily bag limit of 5 fish to an 18 inch minimum size limit and a daily bag limit of 3 fish.

The Management Goal is: To increase the walleye population by stocking walleye, size structure of the walleye population (by changing the walleye regulation) and fish habitat (by restoring buffers and woody structures).

This regulation proposal is one tool to help meet the management goal because: There is some evidence that increased minimum length limits can help to increase size structure of fish populations, also implementing this more restrictive regulation would give female walleye at least 2 years to spawn before they were vulnerable to angler harvest.

Do you favor : Changing the existing walleye regulation on Lake Nebagamon from a 15 inch minimum length and daily bag limit of 5 fish to an 18 inch minimum size limit and a daily bag limit of 3 fish?

Fish Team Supervisor Regulation Proposal Review Checklist

Proposal Title		
Lake Nebagamon Walleye Fishery Initiative		
Author	**Reviewer**	**Date**
Scott Toshner	Terry Margenau	06/29/11

Location Information

Affected waterbody(ies)?	
Lake Nebagamon	
County	**WBIC(s)**
Douglas	2865000

Fish Team Supervisor Reviewer Notes:

The proposal is well written and heavily supported by local stakeholders. As with other recent initiatives, this proposal includes several components: regulation change to protect larger/older walleye; stocking of large fingerling walleye to help restore abundance; and protection/enhancement of critical inshore areas.

The basis for this regulation proposal is reduced walleye abundance, which is expected to be the result of angler exploitation on walleye 15-20 inches. The multi-pronged management approach should help restore this high priority walleye fishery in Douglas County.

Recommended Action by Fish Team Supervisor Approve ☒ Reject ☐

Regional Fish Supervisor Regulation Proposal Review Checklist

Proposal Title		
Walleye 18"/3 bag, Lake Nebagamon, Douglas Co		
Author	**Reviewer**	**Date**
Scott Toshner	Steve AveLallemant	07/18/11

Location Information

Affected waterbody(ies)?
Lake Nebagamon

Current Problem

Do the data or analyses demonstrate the stated problem? Yes ☒ No☒

Do the data or analyses indicate a cause for the problem? Yes ☒ No☐

Proposed Regulation Justification **(how the regulation change is expected to help the fishery meet stated Management Objectives)**

Is there adequate documentation that the proposed regulation will achieve objective? Yes ☒ No☒

Which tools were used? (Select all that apply)

Literature (summarized and cited) ☐
Case Study or comparison to other waters (summarized with data) ☒
Modeling of population responses to proposed regulation (modeling results with data and assumptions) ☐

Regional Fish Supervisor Reviewer Notes:
Increased abundance goal via EG walleye stocking is realistic. But it also appears that other sizes at stocking contribute as well, at least in the past. Unless other sizes at stocking are no longer a viable option, EG walleye priority will be relatively low for DNR quotas. NR was also still present at time of last survey. Not sure if that has failed completely at present time since last info presented was from 2005.

One stated goal of regulation change is improved size structure. That too is reasonable though information presented does not show that size structure (or age structure) have declined significantly and are actually presented as "good but variable". Grwoth rates are average now and at goals for adult densitiy not likely to decline so should not impede attaining higher size structure. It does appear that local support is there for increasing size structure.

Proposal is expected to increase natural reproduction fo walleyes. That goal might not be realized unless adult density can be increased beyond the goal of 3 adults/acre. Natural reproduction was sporadic but present and in some years pretty good at adult densities up to 3/acre and good size structure (good proporiton of adults).

Lake Nebagamon has been a low density population over time but it has been fairly consistent and has had some NR throughout though stocking also contributes. Growth rates average as well, not slow or fast. Sort of a "tweener" all around.

Overall not a strong biological need presented for the reg change but it should be expected to increase yield from the fishery and it does have public support so I'm advancing it.

Recommended Action by Regional Fish Supervisor Approve ☒ Reject ☐

Species Team Regulation Proposal Review Checklist

Proposal Title		
Author	**Reviewer** Walleye Team	**Date** 12/14/11

Species Team Reviewer Notes:
Nebagamon Lake- increase minimum length limit from 15” to 18”, reduce bag limit from 5 to 3 walleye/day. Team recommends advancement, with modifications.

Primary management objective is increasing yield in a mixed natural/stocked fishery, and by policy the team endorses use of an 18” minimum and reduced bag limit in lakes which receive stocking of extended growth walleye fingerlings. The team would prefer to see consistency in the identification of the problem and subsequent management goals, and objectives. The proposal will be made stronger by very basic modeling the potential increase in yield under the more conservative rule.

Recommended Action by Species Team Approve ☒ Reject ☐