



Manoomin (Wild Rice) Abundance and Harvest in Northern Wisconsin in 2013

by
Peter F. David
Wildlife Biologist

Administrative Report 15-06
May 2015

**Great Lakes Indian Fish
& Wildlife Commission**

Biological Services Division

P.O. Box 9

Odanah, WI 54861

(715) 682-6619



Acknowledgments: I would like to thank Dara Olson, Lisa David and Neil Kmiecik for their contributions to the completion of this report. *Miigwech!*

MANOOMIN (WILD RICE) ABUNDANCE AND HARVEST IN NORTHERN WISCONSIN IN 2013

INTRODUCTION

As part of its wild rice management program, the Great Lakes Indian Fish and Wildlife Commission (GLIFWC) conducts annual surveys of wild rice abundance on northern Wisconsin waters. These surveys provide a long term data base on wild rice abundance and annual variability in the ceded territory.

GLIFWC also conducts an annual survey to estimate the amount of wild rice harvested off-reservation in the Wisconsin ceded territory. The Wisconsin Department of Natural Resources (WDNR) cooperates with this survey by providing the names and addresses of state wild rice harvest license purchasers, so that both state and tribal harvest can be estimated. The 2013 survey was similar in design to a survey first conducted in 1987, and repeated each year since 1989, with minor modifications as described in the Methods section.

METHODS

Abundance Estimation

A select group of 30 lakes and 10 river or flowage sites have been ground surveyed most years since 1985; abundance information from these waters is used to derive a yearly index of rice abundance in the ceded territory. The index is derived by multiplying the number of acres of rice on each water surveyed by a factor ranging from 1 to 5 which relates to rice density (1=sparse, 5=dense) and then summing the values derived for each of the 40 waters. In addition to abundance information, ground surveys include information on habitat suitability (e.g. abundance of competing vegetation, presence of beaver, obvious development impacts). Ground surveys were conducted from mid-July through late August.

Aerial surveys of some of these waters, and additional waters not ground surveyed, were conducted on six days between August 2nd and August 23rd. Aerial survey information is limited to an estimate of the size and approximate density of the rice beds. These surveys provide abundance information from waters not ground surveyed, help verify ground estimates of manoomin acreage, occasionally fill in survey gaps when ground crews are unable to access lakes, and help inform ricers of stand productivity.

Harvest Estimation

Slightly different techniques were used to estimate harvest by tribal and state ricers. Tribal members who wished to harvest rice off-reservation were required to obtain an off-reservation wild rice harvesting permit. This permit was obtained by 628 individuals in 2013. When individuals obtained their 2013 permit, they were asked to report if they harvested rice (either on- or off-reservation) the previous year. Forty-nine percent (108/222) of the individuals who indicated they had riced in 2012 (categorized as “active” ricers) were surveyed by phone, as well as 20% (83/406) of those individuals who indicated they had not riced the previous year (“inactive” ricers) (Table 1).

The number of tribal members estimated to have harvested off-reservation in 2013 was determined by extrapolating the percent of active respondents in each group (Table 1). Due to differences in sampling and activity rates among groups, separate harvest estimates were made for each group, and then combined to estimate total tribal harvest.

GROUP	TOTAL NUMBER	# SURVEYED	% SAMPLED	% ACTIVE OFF-RESERVATION	EST. # ACTIVE OFF-RESERVATION
ACTIVE ¹	222	108	48.6%	25.9% (n=28 ²)	58
INACTIVE ¹	406	83	20.4%	3.6% (n=3)	15
TOTAL	628	191	30.4%	11.6%	73

¹ Based on activity the previous year; see discussion in text.

² Harvest data was provided by 24 of these 28 individuals.

State rickers were required to obtain a state license. A mail questionnaire was mailed to each of the 757 individuals who obtained a state license. All harvest estimates were made by expanding the results reported by the 329 respondents to the state survey (43% of licensees).

RESULTS AND DISCUSSION

Abundance Estimation

Ground survey results and abundance information for the 40 waters surveyed annually are reported in Figures 1 and 2, and Table 2. In addition, abundance estimates for 45 additional waters surveyed only from the air are listed in Table 3. A total of 2,303 acres of wild rice was estimated for these 85 surveyed waters. Andryk (1986) estimated that the Wisconsin ceded territories supported approximately 5,000 acres of rice in 1985, a year with an abundance index considerably higher than in 2013.

Survey results and field observations indicate that rice abundance in 2013 was below the long-term average, but better than the 3 previous years. The abundance index was below average in both the northwest and north-central portions of the state, but was furthest below average in the north-central (Table 2, Figures 1 and 2). Compared to 2012, the abundance index for the northwest part of the state increased on 13 waters, decreased on 3, and was essentially unchanged on 6, and overall the index increased by 82%. Clam Lake continued to show recovery within the bay that has been protected from carp (Figure 3). Among north-central waters, 5 increased, 3 declined, and 10 were largely unchanged (Table 2, Figure 2), resulting in a 19% increase from 2012. Statewide, the 2013 index (3,114) was 67% of the long-term index average (4,678 from 1985-2013).

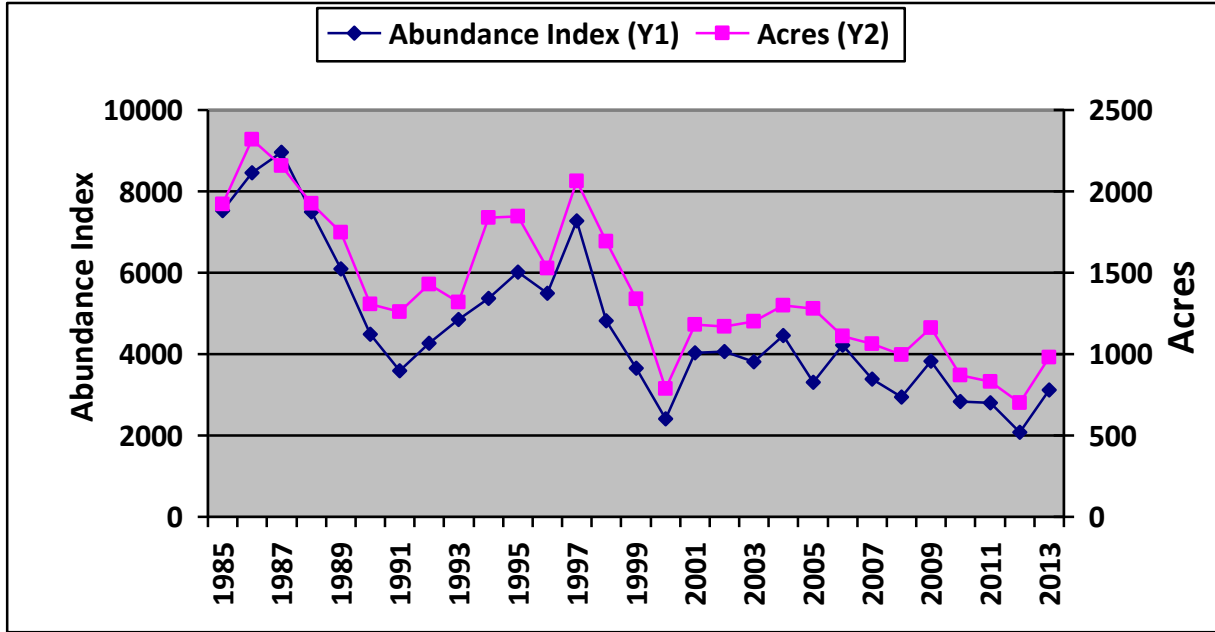


Figure 1. Manoomin abundance index and acreage from 40 Wisconsin rice waters surveyed annually from 1985-2013.

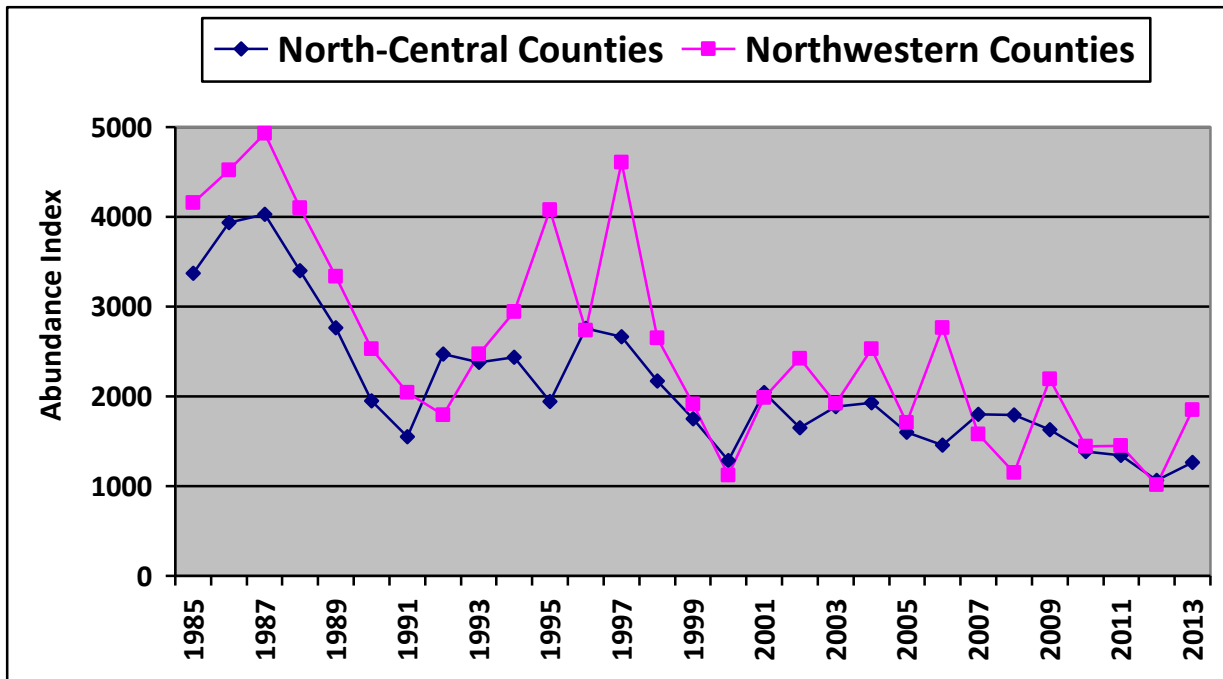


Figure 2. Manoomin abundance index from 40 Wisconsin rice waters surveyed annually from 1985-2013; northwestern versus north-central Wisconsin waters (HWY 13 was used to separate northwestern from north-central waters).

It remains difficult to determine why rice changes in abundance on either the regional or local scale because the environmental factors that influence abundance are not well understood or monitored. Wild rice is affected by a variety of factors, and the relative impact of each varies by year. Some of these factors, such as spring temperatures and water levels, can affect rice regionally, and may account for instances where beds in the north-central counties display one trend in abundance while those in the northwestern region may show another. At the other extreme, a localized impact can cause a stand to fail while those around it flourish. Furthermore, those factors that might explain some of the variation in rice abundance are not being systematically monitored. Thus, explanations about changes in rice abundance remain largely a matter of conjecture.

Annual variability in rice abundance may be inversely related to the amount of water flow through the system. Relatively open systems such as rivers and flowages appear to vary less in rice abundance than relatively closed lake systems. Although open systems may still experience boom and bust years, the level of abundance tends to be closer to the average level most years. This may be because some environmental variables, such as nutrient availability or spring water temperatures, are more consistent in these systems from year to year.



Figure 3. The rice beds on one bay of Clam Lake, Burnett County, in 2008 (left) and 2013 (right). Carp exclosures were erected on this bay by the St. Croix Tribe for the 2011, 2012 and 2013 growing seasons. (Rice beds historically found in other areas of the lake have not demonstrated a similar recovery, although a modest recovery was observed in the southeast bay in 2013, the first area outside of the exclosures to show observable recovery.)

Table 2. Manoomin acreage, density and abundance index from 40 Wisconsin waters for 2010-2013, and the 1985-2013 means.															
A density value of 1=sparse, 5=dense. (Data for 1985-2009 can be found in previous season reports.)															
WATER	2010			2011			2012			2013			1985-2013		
	ACRES	DEN.	INDEX	ACRES	DEN.	INDEX	ACRES	DEN.	INDEX	ACRES	DEN.	INDEX	ACRES	DEN.	INDEX
NORTHWESTERN CTYS.															
BARRON															
SWEENEY CREEK	3	5	15	11	2	22	3	1	3	0	0	0	8	2.4	29
BAYFIELD															
TOTOGATIC LAKE	81	2	162	110	3	330	35	2	70	58	3	174	145	2.5	413
BURNETT															
BASHAW LAKE	1	1	1	1	1	1	0	0	0	1	1	1	9	2.0	23
BIG CLAM LAKE	10	2	20	15	1	15	52	4	208	75	4	300	123	3.2	424
BRIGGS LAKE	8	3	24	20	4	80	10	5	50	17	5	85	26	3.9	102
GASLYN LAKE	20	3	60	4	2	8	8	2	16	11	3	33	21	3.0	72
LONG LAKE	40	3	120	70	4	280	58	2	116	90	3	270	70	2.7	196
MUD LAKE (2)	10	4	40	4	5	20	3	3	9	8	4	32	12	3.6	44
WEBB CREEK	2	4	8	11	5	55	12	5	60	6	3	18	12	4.1	54
DOUGLAS															
MULLIGAN LAKE	0	0	0	0	0	0	0	0	0	1	1	1	20	1.9	48
POLK															
RICE BED CREEK	10	3	30	19	5	95	19	2	38	16	4	64	12	4.2	52
RICE LAKE (1)	45	3	135	24	2	48	0	0	0	20	4	80	42	3.2	148
WHITE ASH LAKE	19	4	76	14	3	42	9	2	18	22	4	88	12	3.2	40
SAWYER															
BILLY BOY FLOW.	1	1	1	19	2	38	12	3	36	10	3	30	13	2.3	40
BLAISDELL LAKE	45	1	45	95	2	190	3	3	9	60	3	180	74	2.7	196
PACWAWONG LAKE	115	5	575	16	2	32	45	2	90	90	2	180	82	3.5	313
PHIPPS FLOWAGE	14	3	42	26	4	104	28	4	112	16	4	64	28	3.9	109
WASHBURN															
DILLY LAKE	5	1	5	1	1	1	1	1	1	4	3	12	16	3.6	67
POTATO LAKE	7	2	14	21	3	63	20	3	60	11	3	33	13	3.0	42
RICE LAKE	5	1	5	5	2	10	9	3	27	7	4	28	18	3.2	67
SPRING LAKE (1)	1	1	1	1	1	1	2	3	6	3	2	6	14	2.6	46
TRANUS LAKE	32	2	64	5	3	15	44	2	88	85	2	170	32	1.7	55
SUBTOTAL	474		1,443	492		1,450	373		1,017	611		1,849	794		2,549
NORTH-CENTRAL CTYS.															
FOREST															
ATKINS LAKE	0	0	0	0	0	0	0	0	0	0	0	0	13	0.5	38
INDIAN/RILEY LAKE	1	3	3	4	2	8	1	1	1	1	1	1	5	2.8	13
PAT SHAY LAKE	25	3	75	12	2	24	2	1	2	0	0	0	30	1.5	51
RAT RIVER	2	2	4	12	3	36	10	4	40	15	4	60	20	4.4	90
WABIKON LAKE	80	3	240	55	3	165	40	1	40	44	3	132	48	2.8	137
LINCOLN															
ALICE LAKE	32	2	64	30	3	90	34	3	102	15	4	60	43	3.0	145
ONEIDA															
FISH LAKE	1	1	1	1	1	1	5	2	10	10	1	10	25	2.9	87
LITTLE RICE LAKE	0	0	0	0	0	0	0	0	0	0	0	0	5	1.0	22
RICE LAKE	10	2	20	5	2	10	40	1	40	4	1	4	52	1.3	89
SPUR LAKE	1	1	1	1	1	1	2	1	2	1	1	1	54	2.7	197
WISCONSIN RIVER	140	4	560	125	5	625	120	5	600	175	4	700	144	4.6	652
PRICE															
BLOCKHOUSE LAKE	0	0	0	0	0	0	1	1	1	0	0	0	13	2.0	44
VILAS															
ALLEQUASH LAKE	10	3	30	16	4	64	14	4	56	28	4	112	56	3.8	231
LITTLE RICE LAKE	8	3	24	12	4	48	16	1	16	9	2	18	18	2.7	59
MANITOWISH RIVER	16	5	80	14	4	56	12	5	60	15	4	60	15	4.5	69
PARTRIDGE LAKE	20	3	60	22	5	110	10	4	40	23	2	46	19	4.1	80
RICE LAKE	36	5	180	12	3	36	4	3	12	10	4	40	26	3.6	92
WEST PLUM LAKE	14	3	42	18	4	72	15	3	45	21	1	21	19	3.1	61
SUBTOTAL	396		1,384	339		1,346	326		1,067	371		1,265	597		2,128
COUNT:			40			40			40			40			40
TOTAL:	870		2,827	831		2,796	699		2,084	982		3,114	1391		4,678
AVERAGE:			71			70			52			78			117

Table 3. Estimated manoomin acreage and density for some waters aerially surveyed in 2013.					
COUNTY	WATER	2013 EST. ACRES	2013 EST. DENSITY	2012 EST. ACRES	2012 EST. DENSITY
Barron	Bear Lake	58	sparse-medium	18	sparse-medium
Bayfield	Chippewa Lake	85	sparse-medium	28	medium
Burnett	Grettum Flowage	10	medium-dense	0	(in drawdown)
	Hay Creek Flowage	2	medium	14	medium
	Lipsett Lake	3	medium		(not surveyed)
	Loon Lake (Carters Bridge)	3	sparse	7	sparse-medium
	Mud Lake (Oakland Township)	45	sparse-medium	45	sparse-medium
	Mud Hen Lake	10	medium		(not surveyed)
	North Fork Flowage	10	medium-dense	62	medium-dense
	North Lang Lake	6	dense	0	-
Phantom Flowage	210	sparse-dense	90	sparse	
Douglas	Lower Ox Lake	6	sparse-medium	0	-
	Minong Flowage (Smiths Bridge) ¹	20	medium	50	medium-dense
	Radigan Flowage	46	medium-dense	40	medium-dense
	St. Croix (Gordon) Flowage	3	sparse-medium	2	sparse-medium
	St. Croix River (Cutaway Dam)	44	medium-dense	26	medium-dense
	Upper Ox Lake	1	dense	1	sparse
Forest	Hiles Millpond	60	sparse-dense	35	medium-dense
	Little Rice Lake	48	medium	280	medium-dense
	Shelp Lake	16	medium	7	medium-dense
Iron	Gile Flowage	1	sparse		(not surveyed)
	Little Turtle Flowage	13	dense	8	dense
	Mud Lake	0	-	2	medium
Lincoln	Unnamed Slough (between Little Pine Creek and the WI River)	10	medium	23	medium-dense
Oneida	Big Lake	12	sparse-medium	15	medium-dense
	Cuenin Lake	17	dense	0	-
	Fourmile Lake	9	dense		(not surveyed)
	Roe Lake	8	medium	1	sparse
	Sevenmile Lake	10	dense	10	medium-dense
	The Thoroughfare	128	medium	102	medium-dense
Polk	Apple River Flowage	24	dense		(not surveyed)
	Somers Lake	12	medium-dense	3	medium-dense
	Wappogasset Lake	14	medium-dense		(not surveyed)
Sawyer	Partridge Crop Lake	18	sparse-medium	6	medium
Taylor	Chequamegon Waters Flowage	-	(not surveyed)	155	medium-dense
Vilas	Aurora Lake	35	medium	8	sparse-medium
	Frost Lake	17	medium	4	sparse
	Irving Lake	30	sparse-medium	110	sparse-medium
	Island Lake ²	125	medium-dense	75	medium-dense
	Lower Ninemile Lake ³	44	sparse-dense	13	sparse-medium
	Nixon Lake	2	sparse	9	dense
	Rice Creek (north of Big Lake)	29	medium-dense	29	dense
	Upper Ninemile Lake	25	medium-dense	21	medium-dense
Washburn	Long, Mud, & Little Mud Lakes	35	medium-dense	17	medium-dense
	Trego Flowage	15	dense	10	dense
	Whalen Lake	2	dense		(not surveyed)

¹ The outlet of this flowage is located in Washburn County, but the rice bed is in Douglas County; flowage in drawdown in 2013.

² Including the portion of Rice Creek below CTY K

³ The outlet of this flowage is located in Oneida County, but the majority of the rice is in Vilas County.

Harvest Estimation

Responses were obtained from 191 tribal permit holders (Table 1) and 329 state licensees. Survey respondents were asked to report all harvest which occurred under their permit. For state licensees, this included on- and off-reservation harvest; for tribal members it included only off-reservation harvest, since no permit is required to harvest on-reservation. Thirty-one of the tribal and 294 of the state licensees surveyed reported harvesting rice in 2013. The total number estimated active in each group were 73 tribal members and 681 state licensees (Table 4).

Tribal harvesters active off-reservation reported making from 1 to 10 ricing trips, averaging approximately 3.3 trips. Tribal survey respondents made a total of 93 off-reservation harvesting trips, gathering 5,085 pounds of green rice (Appendix 1), with an extrapolated total harvest estimate of 12,715 pounds in 238 trips, an average of 53 pounds per trip (Table 4). The total off-reservation harvest per active tribal license averaged 174 pounds.

		SURVEY RESPONSE INFORMATION						ESTIMATED TOTALS		
	# OF PERMIT HOLDERS	# ACTIVE RESPONDENTS	REPORTED TRIPS	REPORTED POUNDS	AVE. # OF TRIPS	AVE. POUNDS/TRIP	AVE. POUNDS/PERSON	# ACTIVE	# TRIPS	# POUNDS
TRIBAL										
ACTIVE	222	28 ^a	88 ^a	4,920 ^a	3.7	55.8	205.0	58	213	11,890
INACTIVE	406	3	5	165	1.7	33.0	55.0	15	25	825
TRIBAL TOT.	628	31 ^a	93 ^a	5,085 ^a	3.3	53.4	174.2	73	238	12,715
STATE	757	294	755	22,844	2.6	30.3	77.7	681	1,749 ^b	52,914 ^c
TOTAL	1,385	327	848	27,929	2.6	33.1	87.5	754	1,987	65,629

^a Four tribal respondents in the active group indicated they harvested in 2013 but did not provide harvest figures; reported trips, pounds and total harvest for this group based on the 24 individuals providing harvest information.

^b Estimated trips for state ricers was the product of estimated number active (681) and the average number of trips (2.57).

^c Estimated harvest for state ricers was the product of estimated number active (681) and the average pounds per person (77.7).

In comparison, active state licensees reported making from 1 to 14 ricing trips, averaging 2.6 trips. Collectively, state survey respondents made 755 trips, gathering 22,844 pounds of green rice (Table 4, Appendix 1), with an extrapolated total harvest estimate of 52,914 pounds in 1,749 trips, an average of 30 pounds per trip. The harvest per active state license averaged 78 pounds.

The amount of rice harvested per individual varied greatly (Table 5). The most reported by a state ricer was 804 pounds, while the most reported by a tribal ricer was 800 pounds. On the low end of the range, the percentage of tribal ricers who harvested a total of 50 pounds or less fell from 65% in 2012 (David, 2013) to 30%, while for state ricers the figure fell from 68% in 2012 to 52%.

An estimated 90% of the state-licensed ricers (681/757) gathered rice in 2013, versus 12% for the tribes (73/628) (Table 4). Differences in the cost of the permit likely accounts for

part of the difference between the different activity levels observed. The tribal ricing permit is free and is often obtained by individuals obtaining permits for other activities, while the state requires the payment of a modest fee, and thus is rarely obtained by individuals without a strong intention of ricing. The tribal activity rate is also lowered because members are asked to respond only if they harvested rice off-reservation. When on-reservation rice beds have good stands, many tribal ricers concentrate their efforts there.

Table 5. Distribution of harvest among active respondents to the 2013 harvest survey.			
TRIBAL			
POUNDS OF GREEN RICE HARVESTED	INDIVIDUALS		PERCENT OF TOTAL HARVEST
	NUMBER*	PERCENT	
0 - 50	8	29.6	4.0
51 - 100	7	25.9	12.0
101 - 150	2	7.4	4.9
151 - 200	1	3.7	3.9
201 - 300	4	14.8	22.4
301 - 500	3	11.1	21.2
501 - 1000	2	7.4	31.5
1001 +	0	0.0	0.0
STATE			
POUNDS OF GREEN RICE HARVESTED	INDIVIDUALS		PERCENT OF TOTAL HARVEST
	NUMBER	PERCENT	
0 - 50	153	52.0	17.1
51 - 100	78	26.5	26.0
101 - 150	30	10.2	16.4
151 - 200	8	2.7	6.3
201 - 300	19	6.5	21.0
301 - 500	3	1	4.5
501 - 1000	3	1	8.7
1001 +	0	0.0	0.0

* Four active respondents did not report pounds.

The data collected in this survey can be used to estimate off-reservation harvest by tribal permit holders and both total and off-reservation harvest by state licensees. It cannot be used to estimate on-reservation harvest by tribal members, who are not required to have a permit to harvest on-reservation.

Using the approach to estimate harvest described above in the Methods section, total off-reservation harvest for tribal permit holders was estimated at 11,890 pounds of green rice and the total harvest for state permittees was estimated at 52,914 pounds (Table 4), including an estimated 197 pounds from on-reservation waters. Thus, the total off-reservation harvest was estimated at 65,432 pounds, with tribal ricers accounting for 18% of the harvest.

These harvest figures make 2013 a slightly above average harvest year, with an estimated total off-reservation harvest that was 8% above the long-term average (60,701 from 1992-2013)

(Figure 4 and Appendix 2). Although it may seem incongruous that harvest was above average while the crop was below average, harvest is influenced by several variables beyond crop abundance, including the number of active ricers and weather during the harvest season.

In comparing the abundance index to estimated harvest (Figure 4) it is also important to note that the abundance index uses acreage and stand density factors to create an index of seed abundance, but this methodology does not measure actual seed production. Certain factors – such as pollination problems, high plant density, and disease outbreaks – can result in conditions where seed production is limited even when plant abundance is high. Alternatively, seed production can sometimes be quite good even when plant abundance is low.

Evidence from the paddy rice industry indicates that infections of brown-spot disease can have particularly marked impacts on seed production, and this has been observed (though more poorly documented) in natural stands as well. While brown-spot outbreaks were not particularly notable for many years, they appeared to markedly affect rice harvest in 2005 and especially in 2010. If factors related to a changing climate are increasing the frequency of brown-spot outbreaks, it may be worthwhile to develop an index to the annual prevalence of this disease.

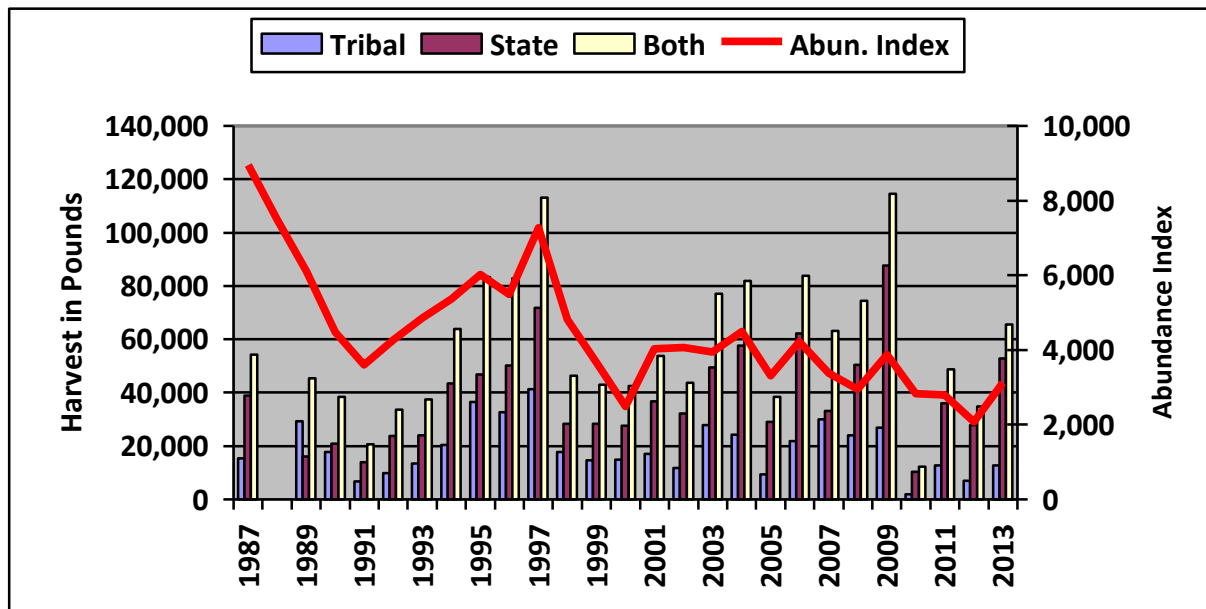


Figure 4. Harvest trends versus abundance index, 1987-2013 (* no harvest estimates for 1988).

The distribution of ricing effort and harvest has tended to reflect the distribution of rice waters in the state, and the abundance of rice on those waters (Figure 5). On the county level, the 2013 harvest in many counties was fairly similar to the long term average (LTA). The counties which varied the most from the LTA were Sawyer (11% above), Vilas (4% above) and Burnett (7% below). For Burnett and Sawyer, a single very good or very poor stand on an important water appeared to explain much of the variation. In Burnett County, Clam Lake remained closed to harvesting as the lake continues to recover from carp-induced losses, while the good stand on the Pacwawong Flowage in Sawyer County was the most heavily harvested water in the state. In 2013, at least 1 pound of harvest was reported from 96 different named waters compared to 69 waters in 2012 (David, 2013), another reflection of the generally improved crop in 2013.

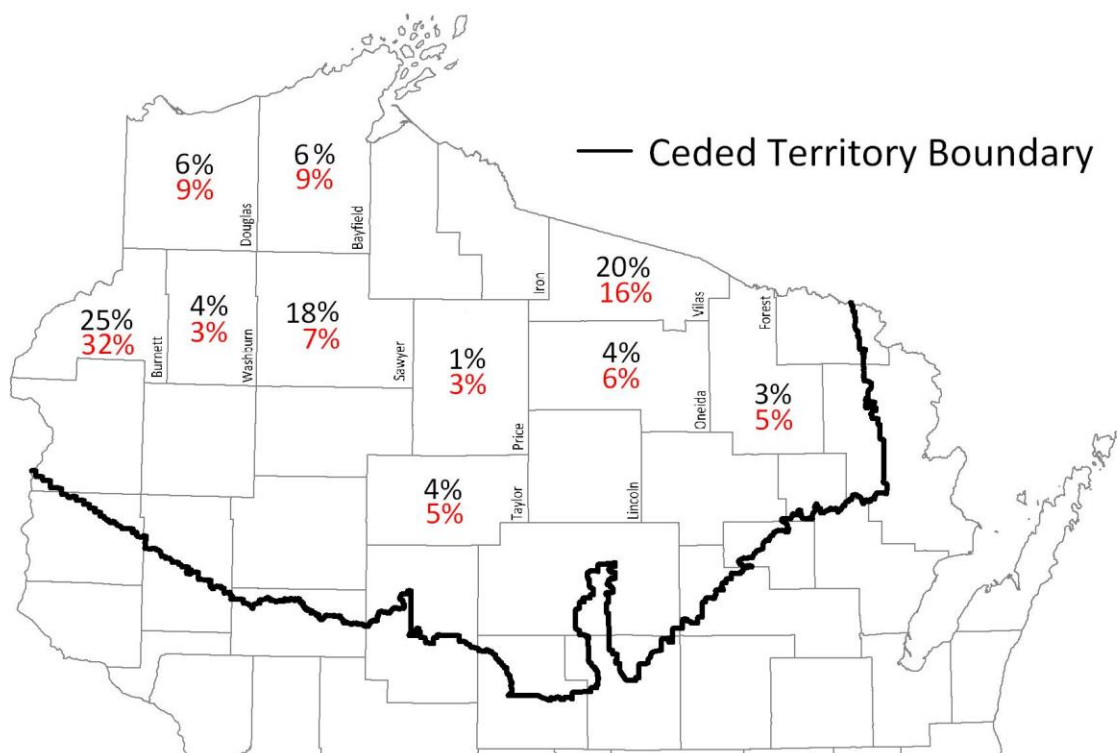


Figure 5. Distribution of the 2013 state and tribal reported manoomin harvest by county (figures in black) compared to the long-term average (1992-2012; figures in red). Data shown for counties which accounted for 3% or more of the reported harvest in either 2013 or over the long-term.

Only 90 of the 22,844 pounds of rice reported harvested by state survey respondents came from waters outside the ceded territory in 2013 (Appendix 1). Sixteen percent of the harvest reported from named locations came from sites planted by the WDNR, the U.S. Forest Service, GLIFWC, or other seeding cooperators, including the fourth and fifth most heavily harvested sites (Chippewa Lake in Bayfield County and Phantom Flowage in Burnett County). (Seeded sites are marked with an asterisk in Appendix 1.) Over the previous 7 years, the percent of harvest coming from seeded sites has varied from 18-31%, and averaged 25% (David, 2013).

Opinions of Respondents

Annual Abundance: Individuals were asked if they felt the 2013 wild rice crop was better, the same, or worse than the 2012 crop. Among the 203 active respondents with an opinion, 67% felt 2013 was better than 2012; 22% felt it was about the same, and 11% felt it was worse.

Rice Worm Abundance: For the tenth consecutive year, survey respondents were asked how they rated the abundance of “rice worms” (larvae stage of the moth *Apamea apamiformis*) in the current year. Among the 273 respondents who expressed an opinion, 21% rated them as very low, 48% as low, 23% as average, 5% as moderately high, and 3% as high (Figure 6).

These figures suggest a fourth year of decline in rice worm abundance from the very high abundance reported in 2009, and similar to the low level reported in 2004. The annual variation in responses to the question over the ten years suggests that year-to-year variation in rice worm abundance may be quite marked.

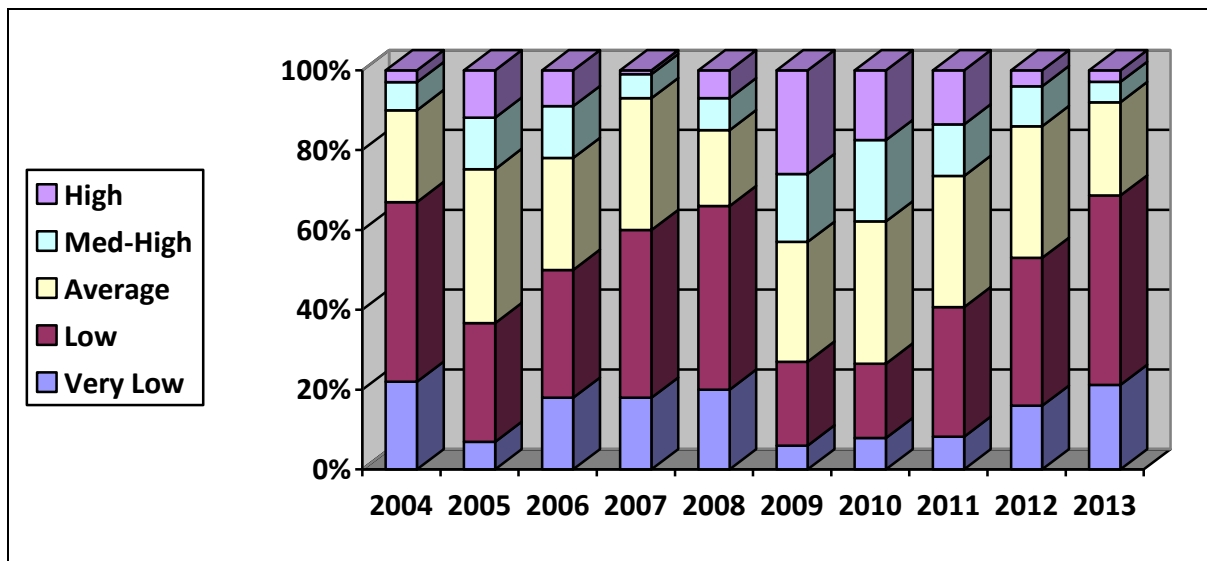


Figure 6. Opinions of manoomin harvest survey respondents on the abundance of rice worms, 2004 through 2013 (for respondents with an opinion).

Brown Spot Disease Prevalence: Following the extensive outbreak of brown spot disease in 2010, a question was added to the 2011 and 2012 harvest survey asking whether respondents felt there was a minor, moderate or severe presence of brown spot disease for each water they riced. This question was modified in 2013 to include a “none” option.

A total of 345 opinions were offered in 2013. The severe category was checked 3 times, for 3 different waters; the moderate category was not checked in 2013; the minor category was checked 163 times for 51 waters (with individual waters checked 1 to 20 times); and the none category was checked 179 times. Waters with a minor presence indicated 10 or more times included Phantom Flowage in Burnett County (10 times); Long Lake in Burnett County (15 times) and Pacwawong Flowage in Sawyer County (20 times).

While it is difficult to directly compare opinions between years, the results from 2013 suggest a very minor presence of brown spot disease in 2013 (Table 6). With additional years of responses to this question, it may be possible to develop an annual index to brown spot prevalence.

Year	Total Opinions	Severe	Moderate	Minor	None
2011	244	12	61	171	(option not offered)
2012	244	8	4	232	(option not offered)
2013	345	3	0	163	179

Date-Regulation: Respondents were asked if they harvested from date-regulated lakes, if they monitored the opening of date-regulated lakes to estimate the ripening of non-date regulated waters, and their general opinion regarding the date-regulation of harvest.

Sixty percent of the 314 individuals who responded to the question (28_ state and 2_ tribal) indicated they often (30%, n=95) or sometimes (30%, n=93) harvest from date-regulated waters, while another 15% (n=47) indicated they do so rarely, and 25% (n=79) indicated they never do. Similar proportions reported using the opening of date regulated lakes to estimate the ripening on non-date regulated waters, with 27% reporting doing so often, 31% doing so sometimes, 15% doing so rarely and 27% never doing so.

A total of 172 state and 24 tribal respondents indicated their opinion regarding date-regulation; 120 respondents offered no opinion. Overall, about 80% of respondents with an opinion favored keeping harvest on some lakes date-regulated (Table 7). (Also see the Comments section below.)

	State % (n)	Tribal % (n)	Combined % (n)
More lakes should be date-regulated	14.5% (25)	29.0% (7)	16.3% (32)
Keep the list of date-regulated waters as it is	37.2% (64)	41.7% (10)	37.8% (74)
Only heavily harvested lakes should be date-regulated	29.1% (50)	12.5% (3)	27.0% (53)
No lakes should be date regulated	19.2% (33)	16.7% (4)	18.9% (37)

Comments: Respondents offered a large number of comments, but relatively few consistent themes emerged. As in most years, the most common comments provided expanded detail on the abundance of the crop or their enjoyment of the experience.

As is often the case, many comments related to the opening of date-regulated lakes. Six respondents felt date-regulated waters opened too early; none suggested they opened too late. Many other comments related to date-regulation were offered including: do what the science suggests or is best for the resource (3); more lead-time on the announcement of openings is needed (2); lakes should not be opened on a pre-set date (1); lakes should be rested between open days early in the season (3); there is a need to education people about ripeness (2); date-regulated lakes seem to open during the work week when many people can't rice without taking off work (1); there may too many lakes being regulated to monitor them effectively (1). Two individuals also suggested additional options be added to the date-regulated opinion survey, including: "only late-maturing lakes should be date-regulated", and "date-regulation is a tribal tradition and should remain where that tradition is important".

Other regulatory-related comments included 3 individuals who felt that voluntary date-regulation on Island Lake is not working, serving only to penalize those who comply with it. One individual suggested the state develop a non-resident ricing license. Two people commented they were glad that Lake Noquebay in Marinette County was posted open this year, but 1 of these indicated that duck hunting interfered with ricing there. One mentioned that it was difficult to access state regulations.

Six respondents indicated GLIFWC's website was very helpful, and 2 indicated they would like to see more aerial photos, 2 wanted to see information posted about processors or places they could purchase equipment, 2 wanted more information on brown spot disease, 1 wanted information on "ricing etiquette" and another on finishing techniques, and 1 felt that it provided too much information.

Concern was also expressed for a number of waters beyond those suggested for seeding, including: Totagatic Lake, Bayfield County (sparse beds); Chequamegon Waters Flowage, Taylor County (giant bur reed expansion); Crex Meadows Flowages, Burnett County (inadequate water for harvesting); Pacwawong Lake, Sawyer County (decline after removal of part of dam); Spring Creek Wildlife Area Flowages, Price County (general failure); and Clam Lake, Burnett County (lack of recovery).

Finally 6 individuals expressed their appreciation for the work done to protect and steward this valuable resource.

Potential Waters for Seeding or Other Restoration: Respondents suggested 21 different waters or properties which might be candidates for seeding or other restoration efforts. Sites named are listed in Appendix 3. (Sites already supporting well-established beds but showing temporary decline were not included.)

LITERATURE CITED

- Andryk, T. 1986. Wild rice wetland inventory of northwest Wisconsin. Great Lakes Indian Fish and Wildlife Commission Administrative Report 86-4. 51 pp.
- David, P.F. 2013. Wild rice (manoomin) abundance and harvest in northern Wisconsin in 2012. Great Lakes Indian Fish and Wildlife Commission Administrative Report 13-04. 18 pp.

Appendix 1. Ricing trips and pounds of green manoomin harvested by respondents to the 2013 harvest survey.
Seeded waters are marked with an asterisk.

COUNTY	WATER	Tribal		State		Combined Total	
		Trips	Pounds	Trips	Pounds	Trips	Pounds
Barron	Bear Lake	0	0	26	730	26	730
	Unnamed	0	0	1	10	1	10
	Subtotal	0	0	27	740	27	740
Bayfield	Chippewa Lake*	4	150	59	1,400	63	1,550
	Totogatic Lake	0	0	7	105	7	105
	Subtotal	4	150	66	1,505	70	1,655
Burnett	Briggs Lake	0	0	10	485	10	485
	Clam River	0	0	1	35	1	35
	Kent Lake	0	0	1	53	1	53
	Long Lake	0	0	97	3,210	97	3,210
	Loon Lake	1	50	0	0	1	50
	Mud Hen Lake	1	50	6	280	7	330
	Mud Lake (1) (Swiss Township)	2	100	0	0	2	100
	Mud Lake (2) (Oakland Twn)	0	0	20	376	20	376
	Namekagon River	0	0	1	2	1	2
	North Fork Flowage*	0	0	1	2	1	2
	North Lang Lake	0	0	4	386	4	386
	Phantom Flowage*	0	0	33	1,215	33	1,215
	Rice Lake	2	120	6	157	8	277
	Webb Creek (east)	0	0	1	42	1	42
	Yellow River	2	100	5	183	7	283
	Subtotal	8	420	186	6,426	194	6,846
Chippewa	Cedar Creek	0	0	1	15	1	15
	Subtotal	0	0	1	15	1	15
Douglas	Amnicon Lake	0	0	2	0	2	0
	Bear Lake	1	35	6	120	7	155
	Lower Ox Lake	0	0	2	40	2	40
	Minong Flowage	0	0	1	20	1	20
	Moose Branch (Jackson Box) Flowage*	0	0	1	0	1	0
	Radigan Flowage	0	0	8	125	8	125
	St Croix River	6	420	13	422	19	842
	St. Louis River	0	0	4	355	4	355
	Upper Ox Lake	0	0	3	75	3	75
	Subtotal	7	455	40	1,157	47	1,612

(Appendix 1 continued on the next page.)

Appendix 1. Ricing trips and pounds of green manoomin harvested by respondents to the 2013 harvest survey (cont.). Seeded waters are marked with an asterisk.							
COUNTY	WATER	Tribal		State		Combined Total	
		Trips	Pounds	Trips	Pounds	Trips	Pounds
Dunn	Red Cedar River	0	0	2	11	2	11
	Tainter Lake	0	0	3	6	3	6
	Subtotal	0	0	5	17	5	17
Forest	Hiles Millpond*	0	0	5	387	5	387
	Little Rice Lake	0	0	1	180	1	180
	Rat River	1	10	1	150	2	160
	Rice Lake	0	0	2	85	2	85
	Wabikon Lake	1	0	2	11	3	11
	Subtotal	2	10	11	813	13	823
Iron	Little Turtle Flowage*	0	0	13	311	13	311
	Subtotal	0	0	13	311	13	311
Langlade	Miniwakan Lake*	0	0	3	145	3	145
	Pickereel Creek (Goose Island)	0	0	1	15	1	15
	Subtotal	0	0	4	160	4	160
Lincoln	Alice Lake	0	0	11	201	11	201
	Jersey City Flowage*	0	0	1	5	1	5
	Wisconsin River	0	0	9	124	9	124
	Subtotal	0	0	21	330	21	330
Marinette	Noquebay Lake	0	0	2	28	2	28
	Subtotal	0	0	2	28	2	28
Oneida	Big Lake	0	0	2	30	2	30
	Cuenin Lake	1	20	24	626	25	646
	Gary Lake	0	0	7	122	7	122
	Rhineland Flowage	0	0	5	90	5	90
	Sevenmile Lake*	0	0	2	50	2	50
	The Thoroughfare	0	0	5	117	5	117
	Thunder Lake	0	0	1	0	1	0
	Unnamed	2	5	0	0	2	5
	Wisconsin River	0	0	3	165	3	165
	Subtotal	3	25	49	1,200	52	1,225

(Appendix 1 continued on the next page.)

Appendix 1. Ricing trips and pounds of green manoomin harvested by respondents to the 2013 harvest survey (cont.). Seeded waters are marked with an asterisk.							
COUNTY	WATER	Tribal		State		Combined Total	
		Trips	Pounds	Trips	Pounds	Trips	Pounds
Polk	Apple River	0	0	1	30	1	30
	Balsam Branch	0	0	7	192	7	192
	Big Round Lake	0	0	3	72	3	72
	Fox Creek	0	0	1	20	1	20
	Joel Flowage*	0	0	6	40	6	40
	Little Butternut Lake	0	0	1	20	1	20
	Rice Lake	0	0	1	58	1	58
	Somers Lake	0	0	2	6	2	6
	St Croix River	0	0	1	17	1	17
	Wapogasset Lake	0	0	2	41	2	41
	White Ash Lake	0	0	6	207	6	207
		Subtotal	0	0	31	703	31
Price	Lower Steve Creek Flowage*	0	0	2	96	2	96
	South Fork Flambeau River	0	0	2	24	2	24
	Unnamed	0	0	5	135	5	135
		Subtotal	0	0	9	255	9
Rusk	Lea Lake Flowage*	0	0	4	130	4	130
		Subtotal	0	0	4	130	4
Sawyer	Barker Lake	0	0	1	22	1	22
	Blaisdell Lake	0	0	10	196	10	196
	Chippewa River, West Fork	0	0	2	63	2	63
	Pacwawong Lake	26	2,135	62	1,860	88	3,995
	Phipps Flowage	0	0	30	814	30	814
	Totagatic River	1	10	0	0	1	10
		Subtotal	27	2,145	105	2,955	132
Taylor	Chequamegon Waters Flowage*	0	0	7	457	7	457
	Mondeaux Flowage	0	0	16	611	16	611
		Subtotal	0	0	23	1,068	23
Trempealeau	Long Lake	0	0	1	30	1	30
	Trempealeau River	0	0	4	13	4	13
		Subtotal	0	0	5	43	5
Unnamed	Unnamed	0	0	2	53	2	53
		Subtotal	0	0	2	53	2

(Appendix 1 continued on the next page.)

Appendix 1. Ricing trips and pounds of green manoomin harvested by respondents to the 2013 harvest survey (cont.). Seeded waters are marked with an asterisk.								
COUNTY	WATER	Tribal		State		Combined Total		
		Trips	Pounds	Trips	Pounds	Trips	Pounds	
Vilas	Allequash Lake	0	0	19	620	19	620	
	Aurora Lake	3	180	19	682	22	862	
	Frost Lake	0	0	1	14	1	14	
	Irving Lake	4	150	9	516	13	666	
	Island Lake	28	1,290	14	782	42	2,072	
	Lower Ninemile Lake	0	0	1	7	1	7	
	Mud Creek	0	0	1	15	1	15	
	Nixon Lake	1	40	0	0	1	40	
	Rest Lake	0	0	4	130	4	130	
	Rice Creek	1	40	7	245	8	285	
	Rice Lake	0	0	2	103	2	103	
	Round Lake	3	140	1	10	4	150	
	Unnamed	0	0	1	50	1	50	
	Upper Ninemile Flowage	0	0	6	535	6	535	
	Subtotal		40	1,840	85	3,709	125	5,549
	Washburn	Black Brook Flowage*	0	0	1	10	1	10
Dilly Lake		0	0	9	143	9	143	
Little Mud Lake		0	0	4	157	4	157	
Mud Lake		0	0	5	87	5	87	
Potato Creek		0	0	8	231	8	231	
Potato Lake		0	0	4	60	4	60	
Spring Lake		0	0	1	24	1	24	
Tranus Lake		2	40	15	219	17	259	
Trego Flowage		0	0	8	78	8	78	
Unnamed		0	0	2	32	2	32	
Whalen Lake		0	0	2	50	2	50	
Yellow River		0	0	6	133	6	133	
Subtotal			2	40	65	1,224	67	1,264
Waukesha	Mukwonago River	0	0	1	2	1	2	
	Subtotal	0	0	1	2	1	2	
GRAND TOTAL		93	5,085	755	22,844	848	27,929	
A) Total From Seeded Waters		4	150	137	4,243	141	4,393	
B) Total (excluding unnamed waters)		91	5,080	744	22,564	835	27,644	
A/B		4.4%	3.0%	18.4%	18.8%	16.9%	15.9%	

APPENDIX 2. Wisconsin manoomin harvest summary, 1992-2013

NOTE: The tribal harvest estimate is off-reservation only; state harvest estimate is on and off reservation, although only a small amount is from on-reservation waters.

YEAR	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	AVE.
EST. TRIBAL HARV.	9,850	13,500	20,429	36,524	32,643	41,332	17,868	14,766	14,925	17,098	11,713	27,802	24,265	9,378	21,830	30,123	24,055	26,805	2,032	12,773	6,975	12,715	19,518
EST. TRIBAL TRIPS	164	205	324	891	680	592	396	370	268	432	352	511	515	255	405	545	552	731	263	422	396	238	432
EST. STATE HARV.	23,800	24,000	43,534	47,164	50,517	71,741	28,451	28,310	27,698	36,668	32,073	49,358	57,607	29,041	62,091	33,120	50,433	88,008	10,302	36,006	27,947	52,914	41,399
EST. STATE TRIPS	506	558	888	1,091	1,094	1,246	954	971	881	1,076	984	1,453	1,581	1,324	1,660	1,316	1,456	2,135	1,032	1,668	1,351	1,749	1,226
COMBINED TRIPS	670	763	1,212	1,982	1,774	1,838	1,350	1,341	1,149	1,508	1,336	1,964	2,096	1,579	2,065	1,861	2,008	2,866	1,295	2,090	1,747	1,987	1,658
COMBINED HARV.	33,650	37,500	63,963	83,688	83,160	113,073	46,319	43,076	42,623	53,766	43,786	77,160	81,872	38,419	83,921	63,243	74,488	114,813	12,334	48,779	34,922	65,629	60,917
COMB. OFF-REZ HARV	33,650	37,500	63,963	83,443	82,949	113,073	46,161	42,752	42,333	52,736	43,542	76,943	81,633	38,186	83,771	63,243	74,247	114,523	12,334	48,080	34,922	65,432	60,701
COMBINED # ACTIVE	404	391	499	529	563	641	574	540	460	563	497	663	666	544	721	608	717	1,040	558	796	652	754	608
% TRIBAL	0.29	0.36	0.32	0.44	0.39	0.37	0.39	0.34	0.35	0.32	0.27	0.36	0.30	0.24	0.26	0.48	0.32	0.23	0.16	0.26	0.20	0.18	0.31
# TRIBAL PERMITS	607	774	827	857	729	922	911	907	897	884	781	944	831	850	910	1,248	1,306	858	1,019	566	638	628	859
EST. TRIBAL ACTIVE	162	186	122	171	213	176	158	140	116	139	104	96	86	72	116	101	153	197	95	149	143	73	135
% TRIBAL ACTIVE	0.27	0.24	0.15	0.2	0.29	0.19	0.17	0.15	0.14	0.16	0.13	0.1	0.1	0.08	0.13	0.08	0.12	0.23	0.09	0.26	0.22	0.12	0.16
TRIBAL AVE # TRIPS	1	1.1	2.7	5.2	3.2	3.4	2.5	2.6	2.3	3.1	3.4	5.3	6	3.5	3.5	5.4	3.6	3.7	2.8	2.8	2.8	3.3	3.3
TRIBAL LBS/TRIP	60	66	63	41	48	70	45	40	56	40	33	54	47	37	54	55	44	37	8	30	18	53	45
TRIBAL HARV/ACTIVE	61	73	167	214	153	235	113	105	129	123	113	290	282	130	188	298	157	136	21	86	49	174	150
# STATE PERMITS	285	225	405	402	388	508	488	467	396	488	432	621	665	585	659	605	651	914	611	740	592	757	540
EST. STATE ACTIVE	242	205	377	358	350	465	416	400	344	424	393	567	580	472	605	507	564	843	463	647	509	681	473
% STATE ACTIVE	0.85	0.91	0.93	0.89	0.9	0.92	0.85	0.86	0.87	0.87	0.91	0.91	0.87	0.81	0.92	0.84	0.87	0.92	0.76	0.87	0.86	0.90	0.90
STATE AVE # TRIPS	2.1	2.7	2.4	3	3.1	2.7	2.3	2.4	2.6	2.5	2.5	2.6	2.7	2.8	2.7	2.6	2.6	2.5	2.2	2.6	2.7	2.6	2.6
STATE LBS/TRIP	47	43	49	43	46	58	30	29	31	34	33	34	36	22	37	25	35	41	10	22	21	30	34
STATE HARV/ACTIVE	98	117	115	132	144	154	68	71	81	86	82	87	99	62	103	65	89	104	22	56	55	78	89
COMBINED # PER TRIP	50	49	53	42	47	62	34	32	37	36	33	39	39	24	41	34	37	40	10	23	20	33	37
NAMED SITES w/ HARV.	35	50	53	65	71	68	66	76	65	74	71	92	94	98	89	98	102	102	70	87	69	96	77

Appendix 3. Waters suggested for seeding or restoration by respondents to the 2013 wild rice harvest survey.*		
COUNTY	WATER	NOTES
Bayfield	Jackson Lake (s. end near Namekagon Lk)	GLIFWC is not familiar with this site, but it appears potentially suitable. May be influenced by operation of the Namekagon Dam.
Burnett	Black Brook Flowage Spencer Lake Yellow River (STH 35 to Yellow Lake Dam)	This site will be investigated for possible re-seeding. Historic water that has done poorly in recent years; needs investigation Some good patches of rice already exist in this section; not clear if other areas are suitable.
Dodge	Horicon Marsh	Outside ceded territory; possible location for action by WDNR
Dodge/ Washington	Theresa Marsh	Outside ceded territory; possible location for action by WDNR
Douglas	Jackson Box Lyman Lake Mulligan Lake	Initial seeding has had limited success; beaver/water level issues may be limiting success A fairly developed lake but may have areas of suitable habitat. Restoration not likely to succeed until a beaver dam downstream on private land can be removed
Iron	Gile Flowage Turtle Flambeau Flowage (South end)	Water level control on the area of suitable habitat is limited. Some rice has been established in this area but the extent of possible suitable habitat has not been well established
Lincoln	Jersey City Flowage	Some seeding has occurred on this site; possible limiting factors have not been well identified
Oneida	Julia Lake Spur Lake Wolf River / Upper Post Lake	Appears to merit evaluation. Some change in hydrology appears to be keeping this lake too deep for good rice growth in recent years. Possible location, but good rice beds upstream suggest something may be unsuitable in this area; perhaps operation of the Post Lake Dam.
Polk	Clam Falls Flowage	Past investigations suggest water levels are slightly too deep for good rice growth.
Sawyer	Round Lake (Lake) Winter	Heavily developed lake, coupled with dam operation, may limit habitat suitability. Possible location, but dam operation may limit suitability.
Sheboygan	Sheboygan Marsh	Outside ceded territory; possible location for action by WDNR
Wood	Sandhill WA Flowages	Outside ceded territory; possible location for action by WDNR

* Suggested waters which appear to have relatively well established beds but may be in short-term decline were not included.