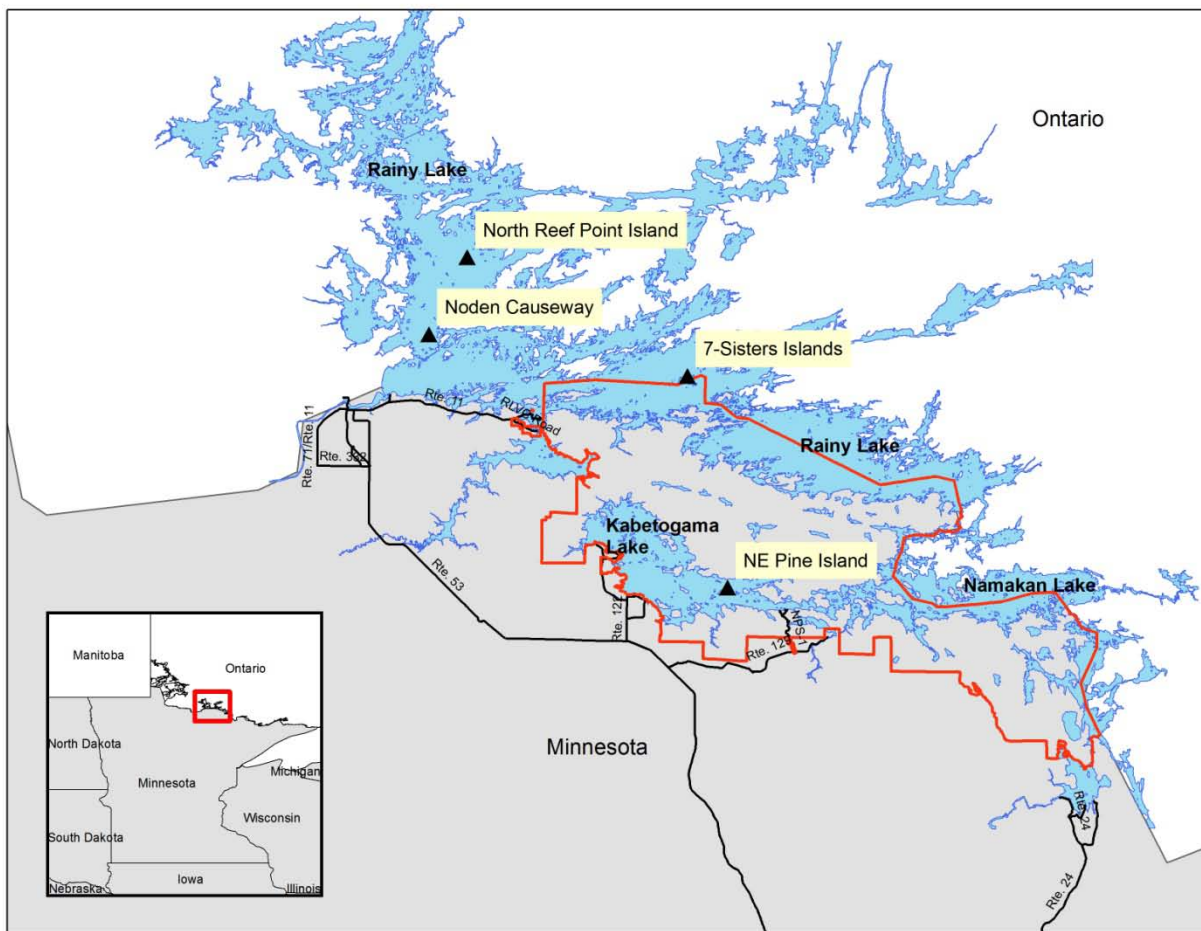


**Voyageurs National Park**  
**Double-Crested Cormorant Research and Monitoring**  
**2008 Summary**

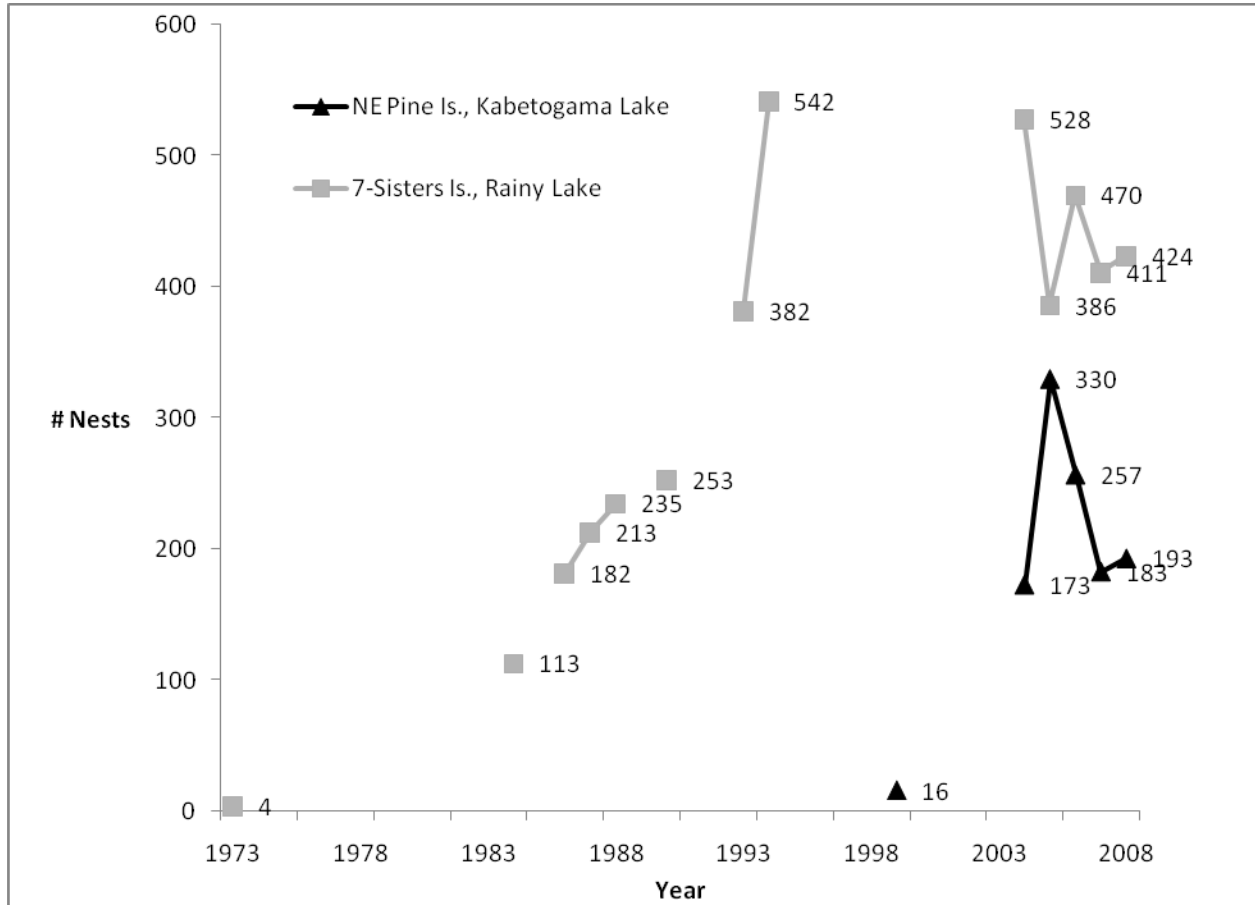


## 2008 Nest Counts

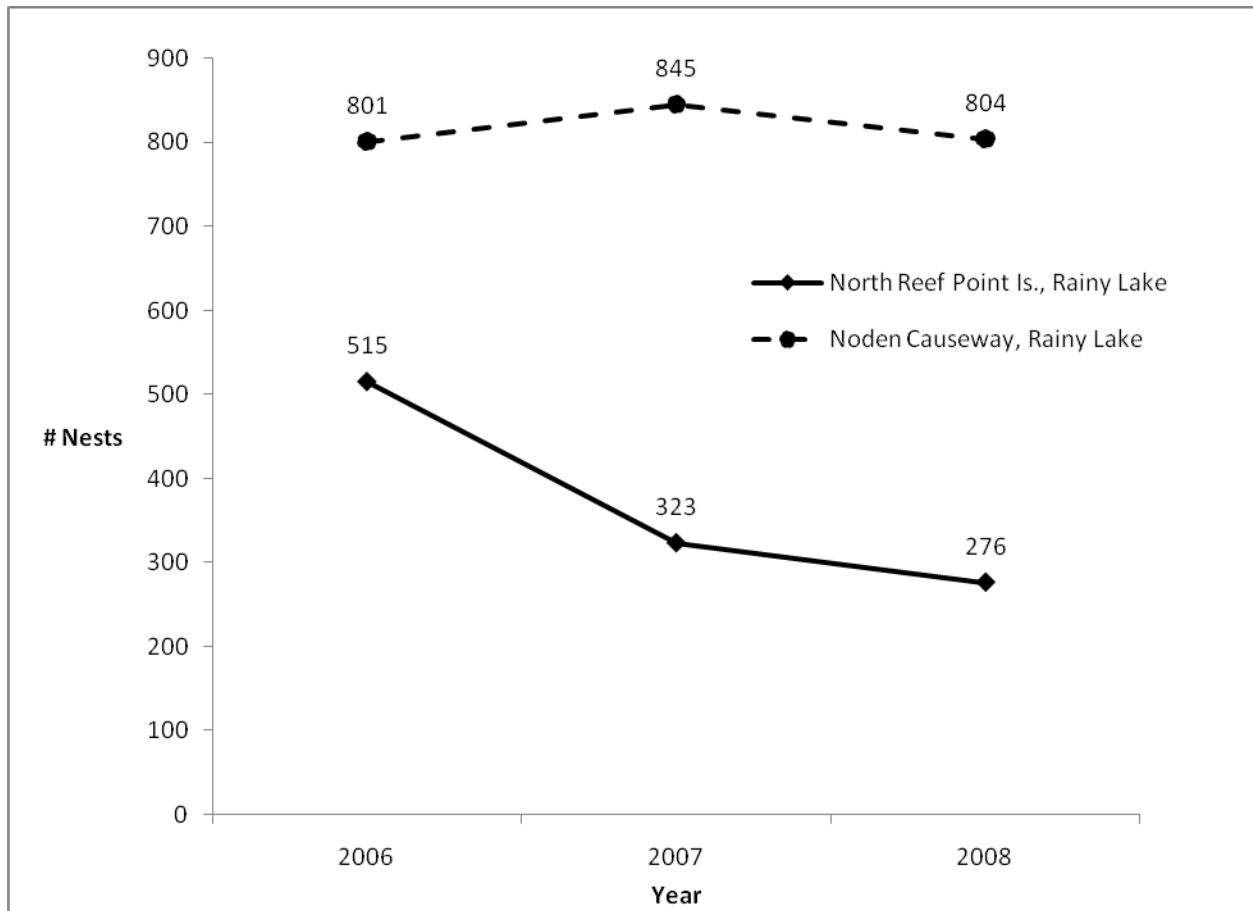
Voyageurs National Park continued monitoring of double-crested cormorant colonies in and adjacent to the park in 2008 at four colony sites (Figure 1). Estimates of nesting cormorants on N.E. Pine Island, Lake Kabetogama (NEP) remained relatively stable in 2008 after two consecutive years of decline following a peak of 330 nests in 2005 (Figure 2). Nest estimates for the Seven Sisters Islands (comprised of two islands with nests) were similar from 2007 to 2008. The largest colony in the area, Noden Causeway, has remained relatively stable since the first survey done in 2006 (Figure 3). Conversely, the North Reef Point Island colony has declined by nearly 50% since the first survey in 2006 (Figure 3). When the North Reef Point Island was visited on August 8, 2008 via boat there were only six cormorants visible on this colony, suggesting that a disease outbreak or some other factor caused widespread nest abandonment (see next section).



**Figure 1. Location of double-crested cormorant nesting colonies in the Voyageurs National Park/Rainy Lake area.**



**Figure 2. Double-crested colony nest counts, 1984-2008, for N.E. Pine Island, Lake Kabetogama, and Seven Sisters Island Group, Rainy Lake. Number of nests were estimated by two different methods over time: ground counts of nests after the fledging period (1973-1999) and counts of active nests from high resolution digital photographs taken from the air during the peak incubation period (2004-2008).**



**Figure 3. Double-crested colony nest counts, 2006-2008, for North Reef Point Island, Rainy Lake and Noden Causeway (Gash Point), Rainy Lake.**

### 2008 Banding and Disease Screening

A banding effort was initiated in 2008 for cormorants on NEP and 7SIS. USFWS aluminum leg bands (#8 goose bands) and colored plastic leg bands (orange with white letters [#AA]) were placed principally on chicks (NEP=102, 7SIS=104) but also on a limited number of adults (NEP=7, 7SIS=6). Blood samples were also drawn from a subset of chicks and adults for disease and parasite screening and stable isotopic analysis of diets. The USGS Wildlife Health Lab (Madison, WI) analyzed blood samples for presence of specific West Nile Virus neutralizing antibodies and oral/anal swabs were tested for Newcastle Disease and Avian Influenza (AI). All results were negative (Table 1). Blood samples are also being tested for presence of Newcastle Disease antibodies; results are pending.

**Table 1. Summary of 2008 disease screening in double-crested cormorants for N.E. Pine Island, Lake Kabetogama, and Seven Sisters Island Group, Rainy Lake. All samples were submitted to and analyzed by the USGS Wildlife Health Center (Madison, WI), except for two chick carcasses collected on Seven Sisters which were submitted to the Canadian Cooperative Wildlife Health Centre. \* Newcastle disease was not confirmed but was the suspected cause of death.**

Disease	<u>N.E. Pine Island</u>				<u>Seven Sisters Island</u>			
	<u>Chicks</u>		<u>Adults</u>		<u>Chicks</u>		<u>Adults</u>	
	Tested	Postive	Tested	Postive	Tested	Postive	Tested	Postive
West Nile Virus (blood)	41	0	7	0	29	0	7	0
Newcastle Disease (swabs)	34	0	7	0	27	0	4	0
Newcastle Disease (blood)	41	pending	7	pending	29	pending	4	pending
Avian Influenza	34	0	7	0	27	0	4	0
Newcastle Disease (carcass)	1	1	0	0	2	0*	0	0

A fledgling cormorant displaying visual signs of disease (e.g., lethargy and ataxia) was collected at the NEP colony on July 22, 2008, and submitted to USGS Wildlife Health Lab (Madison, WI) for testing. Brain tissue tested positive for paramyxovirus-1 (virulent Newcastle Disease negative) and the cause of death was ruled to be a result of the virus. Other fledgling cormorants also displayed signs of the disease but were not sampled. Samples from this bird were also sent to the National Veterinary Services Lab (NVSL) in Ames, IA for confirmation; virulent Newcastle Disease was confirmed from this sample and appropriate agencies were notified. An outbreak of Newcastle Disease (paramyxovirus-1) is suspected to have affected the Seven Sisters Island Group (7SIS) and other colonies on Rainy Lake as well. Carcasses of three fledglings (2 from 7SIS and 1 from Noden Causeway) displaying visual symptoms were submitted to the Canadian Cooperative Wildlife Health Centre for testing but samples were too autolyzed on arrival for adequate testing. The CWHC ruled cause of death of the submitted birds as likely Newcastle Disease based on the reported symptoms and the confirmation of the disease on Lake Kabetogama and elsewhere in Minnesota and Ontario.

The outbreak of paramyxovirus-1/Newcastle Disease did not appear to strongly affect breeding adults but higher than normal chick mortality was observed in 2008. The effects of this outbreak on local cormorant abundance may not be observed for 2-3 years, when chicks hatched in 2008 recruit into the breeding population.

## **2008 Radio Telemetry**

Seven adult cormorants were fitted with backpack style radio (VHF) transmitters in July 2008 on the NEP colony (Table 2). Survival and movements were monitored by boat and airplane until mid-September 2008 when all birds had left the area. One cormorant was predated by an eagle in July and another died of unknown causes. Movement and habitat-use data have been digitized but no analyses have taken place to date.

## **2008 Diet Composition**

Regurgitant samples were collected from cormorant chicks from June 26 to July 22, 2008, from NEP and 7SIS. Regurgitants were not collected after July 22, 2008, because of the unknown human health risks associated with visiting colonies where birds were confirmed to be affected by avian paramyxovirus-1. Yellow perch comprised 36.4% of the diet (by mass) of cormorant chicks on NEP (Table 3; Figure 4). Cyprinids, mudminnows, lake whitefish, centrarchids, and walleyes/saugers each comprised less than 10% of the diet. Conversely, ciscoes comprised 66.1% of the diet on 7SIS, with mudminnows (6.5%) and walleyes (6.3%) making up the next largest fractions (Table 4; Figure 4).

Unidentified remains made up 10-12% of the total sample mass from the two colonies in 2008. In most cases, remains could not be identified to any taxonomic level because no external diagnostic markers (e.g., scales, colors, fins) were present. Species that may be more easily digestible (e.g., burbot) probably make up a disproportionate share of this category, though we cannot be certain. Additional efforts will be made in 2009 to reduce the fraction of unidentified remains.

Standard lengths were recorded for individual fish that were whole enough to allow a measurement (NEP=26 fish, 7SIS=15; Table 5). Yellow perch and walleye comprised the majority of samples. Additional efforts will be taken in 2009 to improve estimates of size ranges of fish consumed by cormorant chicks.

**Table 2. Fates of adult double-crested cormorants affixed with radio transmitters on the NE Pine Island (NEP) colony, June-August 2008.**

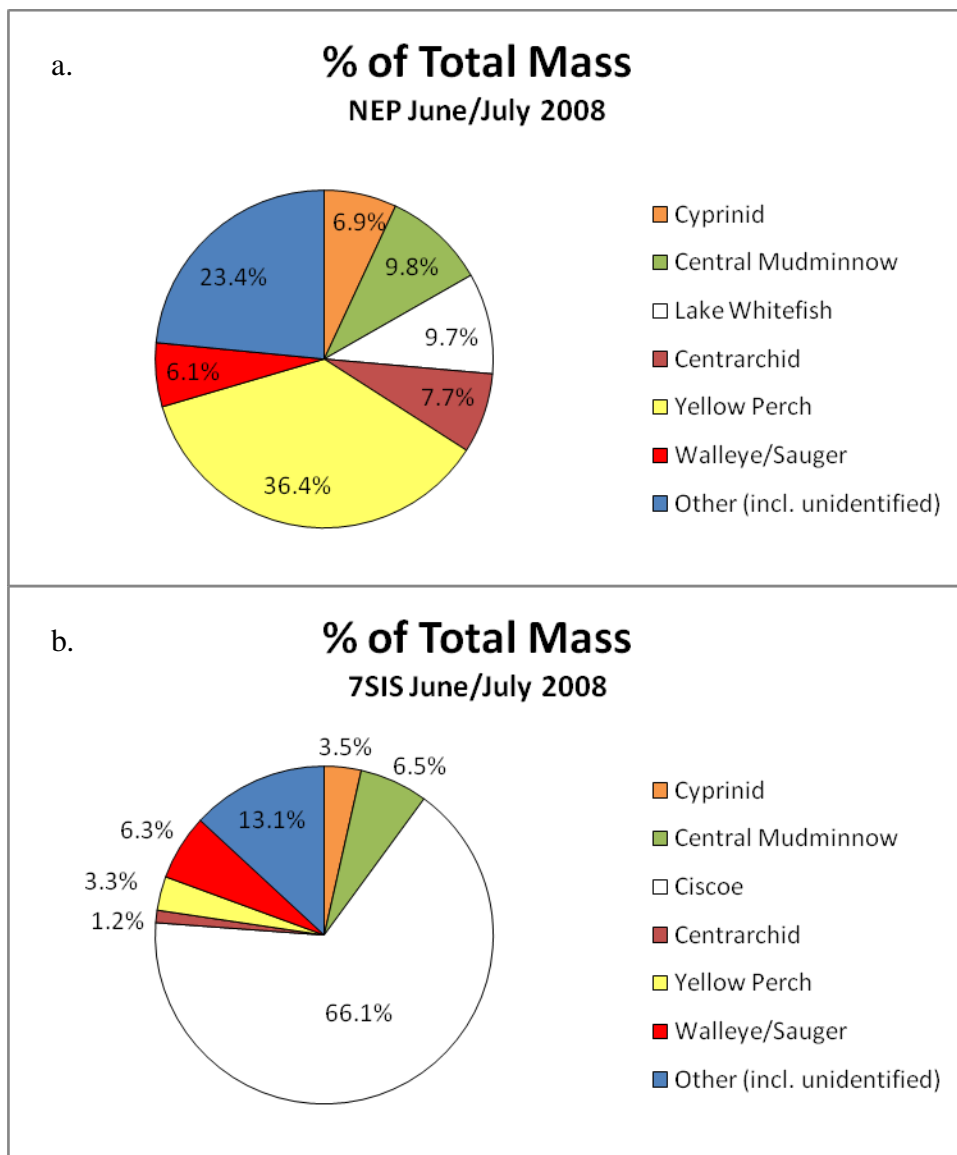
Capture date	Frequency	USGS Band #	Colored Band #	Date of last location	Last location	Fate as of last location	Notes
6/30/2008	167.010	1058-04651	3JC	7/14/2008	near LaBonty's Pt, Kabetogama Lake	Presumed Dead	Found transmitter with full harness under eagle nest
6/30/2008	167.152	1058-04643	3JP	8/19/2008	NEP	Alive	
6/30/2008	167.186	1058-04617	3UU	7/19/2008	near Sullivan Bay, Kabetogama Lake	Presumed Dead	Found transmitter with partial harness - assume predation
6/30/2008	167.321	1058-04626	3UZ	8/5/2008	NEP	Alive	
6/30/2008	167.374	1058-04615	3KA	7/10/2008	NEP	Alive	
6/30/2008	167.477	1058-04623	3UY	7/15/2008	NEP	Alive	
6/30/2008	167.608	1058-04632	3JY	8/4/2008	NEP	Alive	

**Table 3. Composition of fish species (by mass) found in 82 regurgitant samples collected from double-crested cormorant chicks, June 27-July 22, 2008, N.E. Pine Island, Lake Kabetogama, Minnesota.**

<b>Family</b>	<b>Scientific Name</b>	<b>Species</b>	<b>% of Total Mass</b>
Cyprinidae	<i>Luxilus cornutus</i>	Common Shiner	0.77%
Cyprinidae	<i>Notropis spp.</i>	Shiner spp.	1.05%
Cyprinidae	<i>Pimephales spp.</i>	Fathead/Bluntnose minnow	2.58%
Cyprinidae	<i>Phoxinus spp.</i>	N. Redbelly/Finescale dace	0.18%
Cyprinidae	<i>Rhinichthys spp.</i>	Dace spp. (Rhinichthys)	2.09%
Cyprinidae	<i>Cyprinidae</i>	Unk. cyprinid	0.27%
Ictaluridae	<i>Ameiurus melas</i>	Bl. Bullhead	0.00%
Esocidae	<i>Esox lucius</i>	Northern pike	2.95%
Umbridae	<i>Umbra limi</i>	Central mudminnow	9.80%
Salmonidae	<i>Coregonus clupeaformis</i>	Lake whitefish	9.66%
Salmonidae	<i>Coregonus artedi</i>	Ciscoe	0.00%
Gadidae	<i>Lota lota</i>	Burbot	6.59%
Gasterosteidae	<i>Culea inconstans</i>	Brook stickleback	1.64%
Gasterosteidae	<i>Pungititius pungititius</i>	Nine-spine stickleback	0.00%
Centrarchidae	<i>Ambloplites rupestris</i>	Rock bass	6.32%
Centrarchidae	<i>Lepomis macrochirus</i>	Bluegill	0.89%
Centrarchidae	<i>Lepomis spp.</i>	Sunfish spp.	0.47%
Centrarchidae	<i>Micropterus dolomieu</i>	Smallmouth bass	0.00%
Percidae	<i>Percina spp.</i>	Darter spp.	0.01%
Percidae	<i>Etheostoma exile</i>	Iowa darter	0.04%
Percidae	<i>Perca flavescens</i>	Yellow perch	36.37%
Percidae	<i>Stizostedion vitreum</i>	Walleye	4.99%
Percidae	<i>Stizostedion canadense</i>	Sauger	1.13%
		Unidentified fish remains	12.21%
		TOTAL	100.00%

**Table 4. Composition of fish species (by mass) found in 54 regurgitant samples collected from double-crested cormorant chicks, June 26-July 16, 2008, Seven Sisters Island Group, Rainy Lake, Minnesota.**

<b>Family</b>	<b>Scientific Name</b>	<b>Species</b>	<b>% of Total Mass</b>
Cyprinidae	<i>Luxilus cornutus</i>	Common Shiner	0.00%
Cyprinidae	<i>Notropis spp.</i>	Shiner spp.	3.01%
Cyprinidae	<i>Pimephales spp.</i>	Fathead/Bluntnose minnow	0.00%
Cyprinidae	<i>Phoxinus spp.</i>	N. Redbelly/Finescale dace	0.00%
Cyprinidae	<i>Rhinichthys spp.</i>	Dace spp. (Rhinichthys)	0.40%
Cyprinidae	<i>Cyprinidae</i>	Unk. cyprinid	0.12%
Ictaluridae	<i>Ameiurus melas</i>	Bl. Bullhead	1.92%
Esocidae	<i>Esox lucius</i>	Northern pike	0.93%
Umbridae	<i>Umbra limi</i>	Central mudminnow	6.53%
Salmonidae	<i>Coregonus clupeaformis</i>	Lake whitefish	0.00%
Salmonidae	<i>Coregonus artedi</i>	Ciscoe	66.12%
Gadidae	<i>Lota lota</i>	Burbot	0.00%
Gasterosteidae	<i>Culea inconstans</i>	Brook stickleback	0.37%
Gasterosteidae	<i>Pungititius pungititius</i>	Nine-spine stickleback	0.02%
Centrarchidae	<i>Ambloplites rupestris</i>	Rock bass	0.00%
Centrarchidae	<i>Lepomis macrochirus</i>	Bluegill	0.00%
Centrarchidae	<i>Lepomis spp.</i>	Sunfish spp.	0.00%
Centrarchidae	<i>Micropterus dolomieu</i>	Smallmouth bass	1.19%
Percidae	<i>Percina spp.</i>	Darter spp.	0.00%
Percidae	<i>Etheostoma exile</i>	Iowa darter	0.00%
Percidae	<i>Perca flavescens</i>	Yellow perch	3.25%
Percidae	<i>Stizostedion vitreum</i>	Walleye	6.28%
Percidae	<i>Stizostedion canadense</i>	Sauger	0.00%
		Unidentified fish remains	9.87%
		TOTAL	100.00%



**Figure 4. Composition of fish taxa (by mass) from a) 82 regurgitant samples collected from double-crested cormorant chicks, June 27-July 22, 2008, N.E. Pine Island (NEP), Lake Kabetogama, and b) 54 regurgitant samples collected from double-crested cormorant chicks, June 26-July 16, 2008, Seven Sisters Island Group (7SIS), Rainy Lake, Minnesota.**

**Table 5. Mean (range / n) standard lengths (mm) of fish recovered from 82 regurgitant samples collected from double-crested cormorant chicks, June 27-July 22, 2008, N.E. Pine Island (NEP), Lake Kabetogama, and 54 regurgitant samples collected from double-crested cormorant chicks, June 26-July 16, 2008, Seven Sisters Island Group (7SIS), Rainy Lake, Minnesota. For comparison purposes, 50mm  $\approx$  2 in.**

	<u>NEP</u>			<u>7SIS</u>	
	6/30/2008	7/6/2008	7/10/2008	6/26/2008	7/16/2008
N. Pike	-	75.5 (- / 1)	270.0 (- / 1)	-	-
C. Mudminnow	70.0 (56-84 / 2)	-	-	-	-
Ciscoe	-	-	-	-	117.4 (- / 1)
Sm. Bass	-	-	-	-	114.6 (- / 1)
Yellow Perch	-	140.3 (132-148 / 2)	115.7 (57-161 / 18)	-	-
Walleye	-	52.5 (- / 1)	-	47.8 (25-77 / 12)	190.4 (- / 1)

## 2009 Planned Activities

- Aerial nest counts for NEP, 7SIS, and other colonies on the Ontario side of Rainy Lake
- Placement and monitoring of 15-28 additional radio transmitters on adult cormorants on NEP for analysis of survival, movements, and foraging habitat
- Band chicks and adults on NEP and 7SIS; draw blood for disease screening and stable isotope analyses
- Submit 2008/09 blood samples for stable isotope analysis to estimate chick diet and compare to adults for both NEP and 7SIS
- Monitor chick diet via weekly regurgitant sampling for NEP and 7SIS

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Analysis of regurgitant samples – Jake Randa (NDSU)

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