LAKE SUPERIOR FISHERIES ASSESSMENT
Thunder Bay AOC

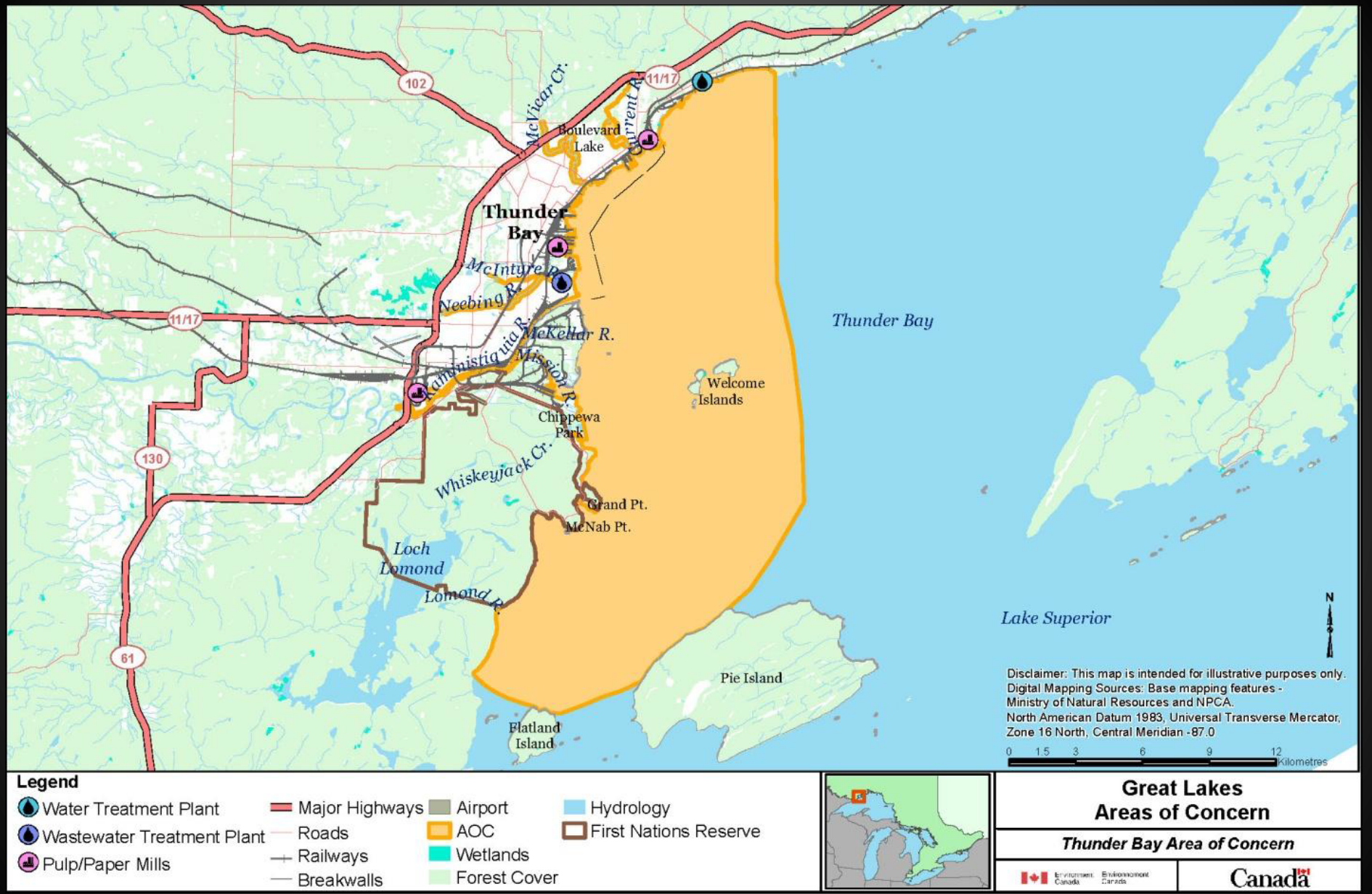
Sept 21st, 2016

Ontario

Upper Great Lakes Management Unit

OUTLINE

- Beneficial Use Impairments
- Delisting Criteria
- What is a healthy fish community?
- Assessment & Monitoring
- Status and Trends


102
11/17
McVicar Cr.
Current R.
Boulevard Lake
Thunder Bay
McIntyre R.
Neebing R.
11/17
McKellar R.
Kaministiquia R.
Mission R.
Welcome Islands
Chippewa Park
130
Whiskeyjack Cr.
Grand Pt.
McNab Pt.
Loch Lomond
Lomond R.
61
Thunder Bay
Lake Superior
Pie Island
Flatland Island
N
Disclaimer: This map is intended for illustrative purposes only.
Digital Mapping Sources: Base mapping features - Ministry of Natural Resources and NPCA.
North American Datum 1983, Universal Transverse Mercator, Zone 16 North, Central Meridian -87.0
0 1.5 3 6 9 12
Kilometres
Legend
Water Treatment Plant
Wastewater Treatment Plant
Pulp/Paper Mills
Major Highways
Roads
Railways
Breakwalls
Airport
AOC
Wetlands
Forest Cover
Hydrology
First Nations Reserve
Great Lakes Areas of Concern
Thunder Bay Area of Concern
Environment Canada
Environnement Canada
Canada

IMPAIRMENT

- Organic Enrichment
- Decreased dissolved oxygen levels
- Increased water temperature
- Changes in fish community structure

Defining & Monitoring a Healthy Fish Community

- Trends in abundance
- Native Species
- Species Diversity
- Natural Reproduction
- Population Structure
- Population Dynamics

Delisting Criteria for Thunder Bay AOC

- Relative Abundance
- Species Composition

Lake Trout

- Mean age > 8yrs
- Index of Growth: Length @ Age 7 = 430mm
- Mature fish / Many age classes.

Lake Whitefish

- Commercial fishery sustainable yield =< 0.51 kg/ha/yr
- Total annual mortality < 60-65%.
- Mean age of catch exceeds age @ 50% maturity by two years

Lake Sturgeon, Walleye & Brook Trout

Survey Objectives

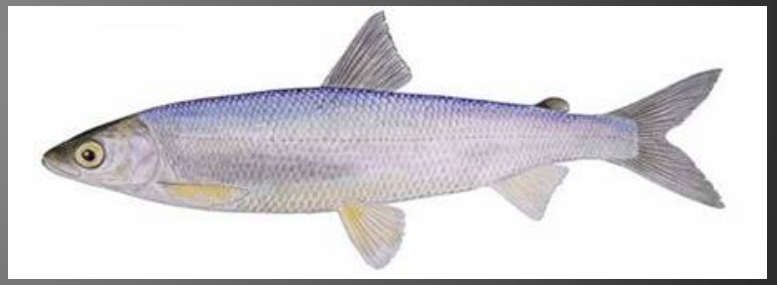
1) Relative abundance

2) Population Dynamics

- Juvenile abundance
- Recruitment
- Growth
- Mortality
- Exploitation

3) Population Structure

- Length
- Age
- Sex ratio



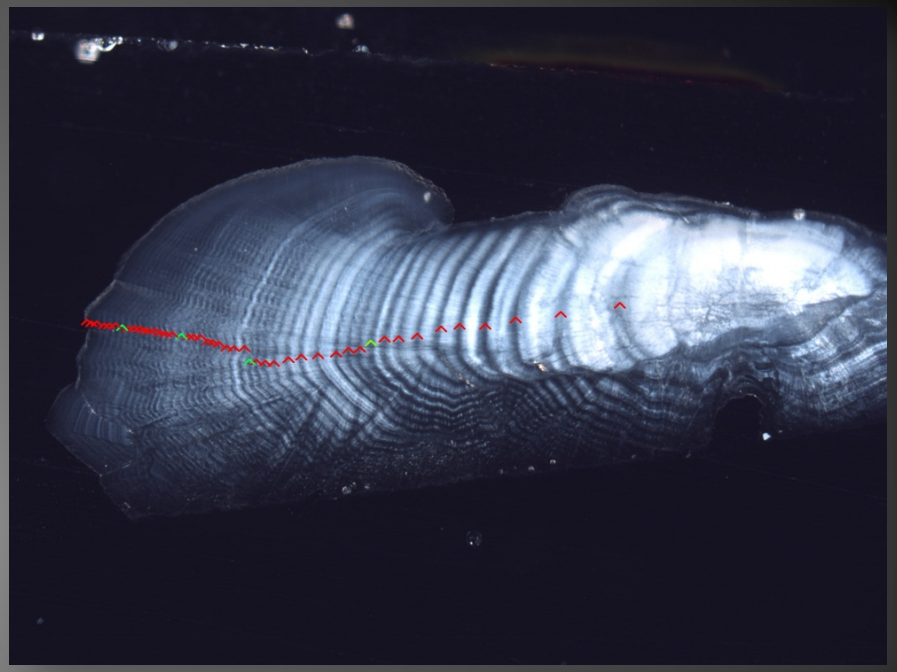
METHODS

- Stratified random sampling
- 1000’ x 6’ gillnets
- 1.5’’- 6’’ mesh.
- 24 hour set

Photo: Laura Darby

Photo: Laura Darby

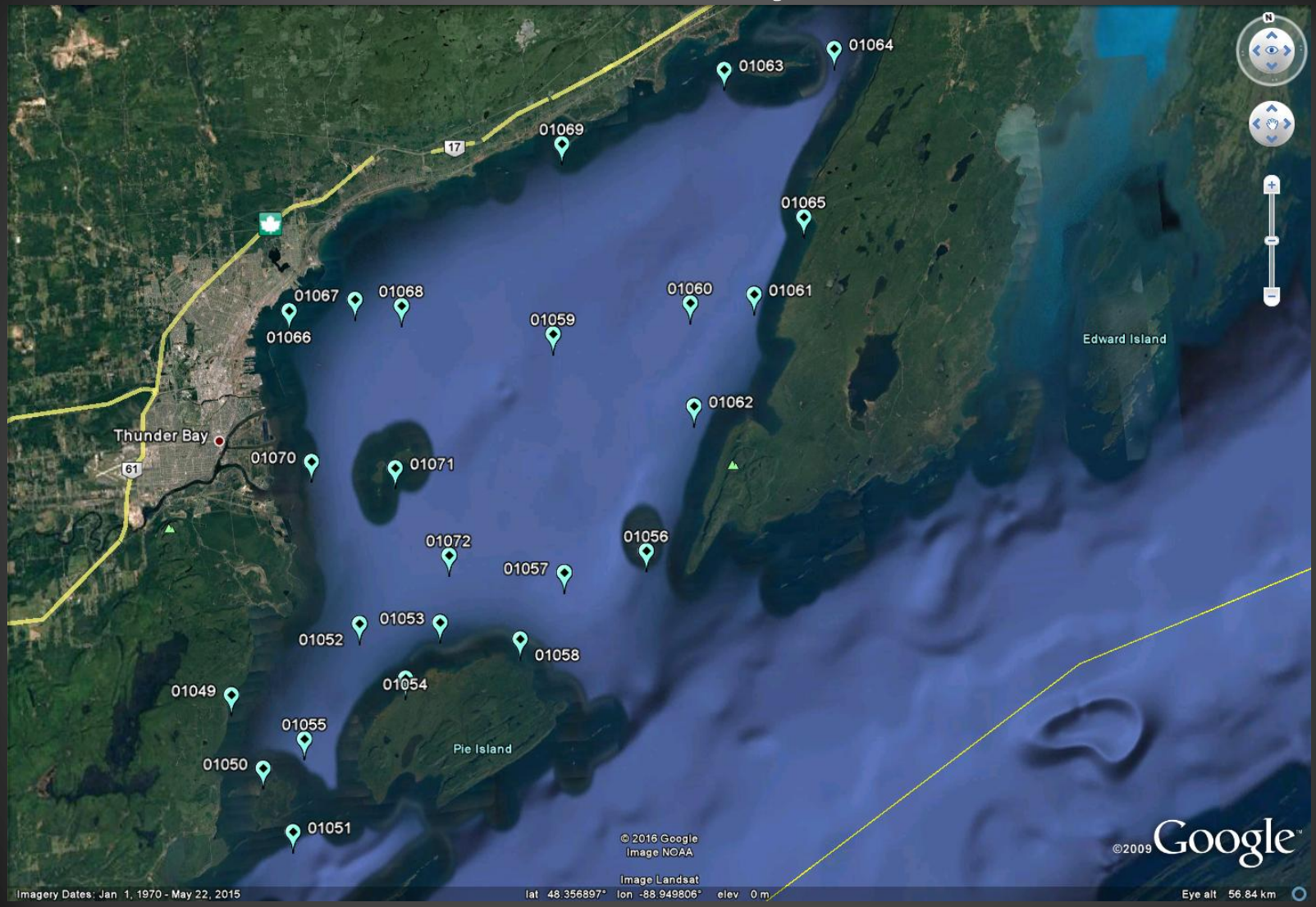
DATA COLLECTION



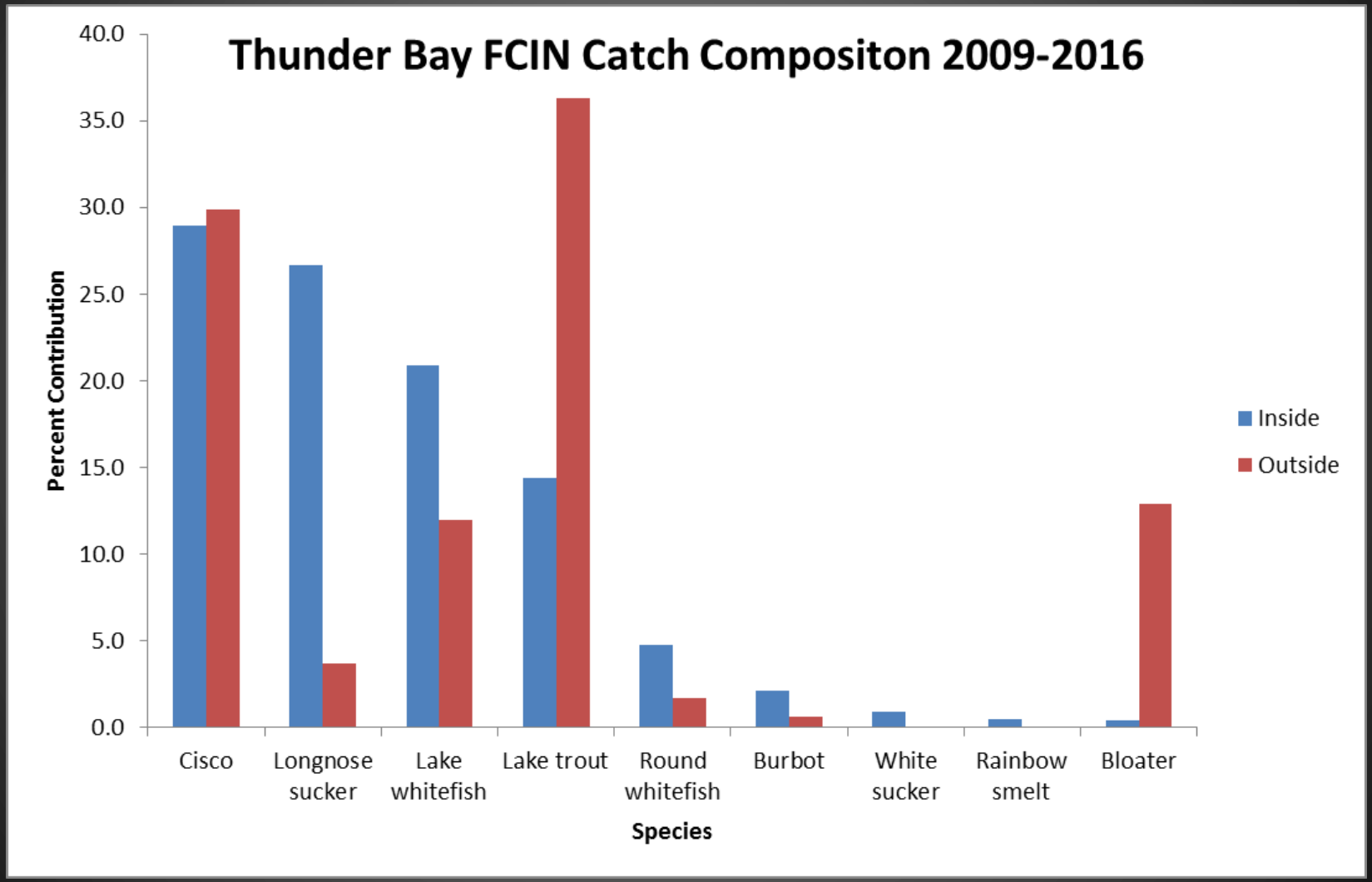
Value Added Data Collection

- Water parameters
- MOE Contaminant Monitoring
- Ecosystem Modelling
- Cisco Morphometrics
- Lakewide collaboration

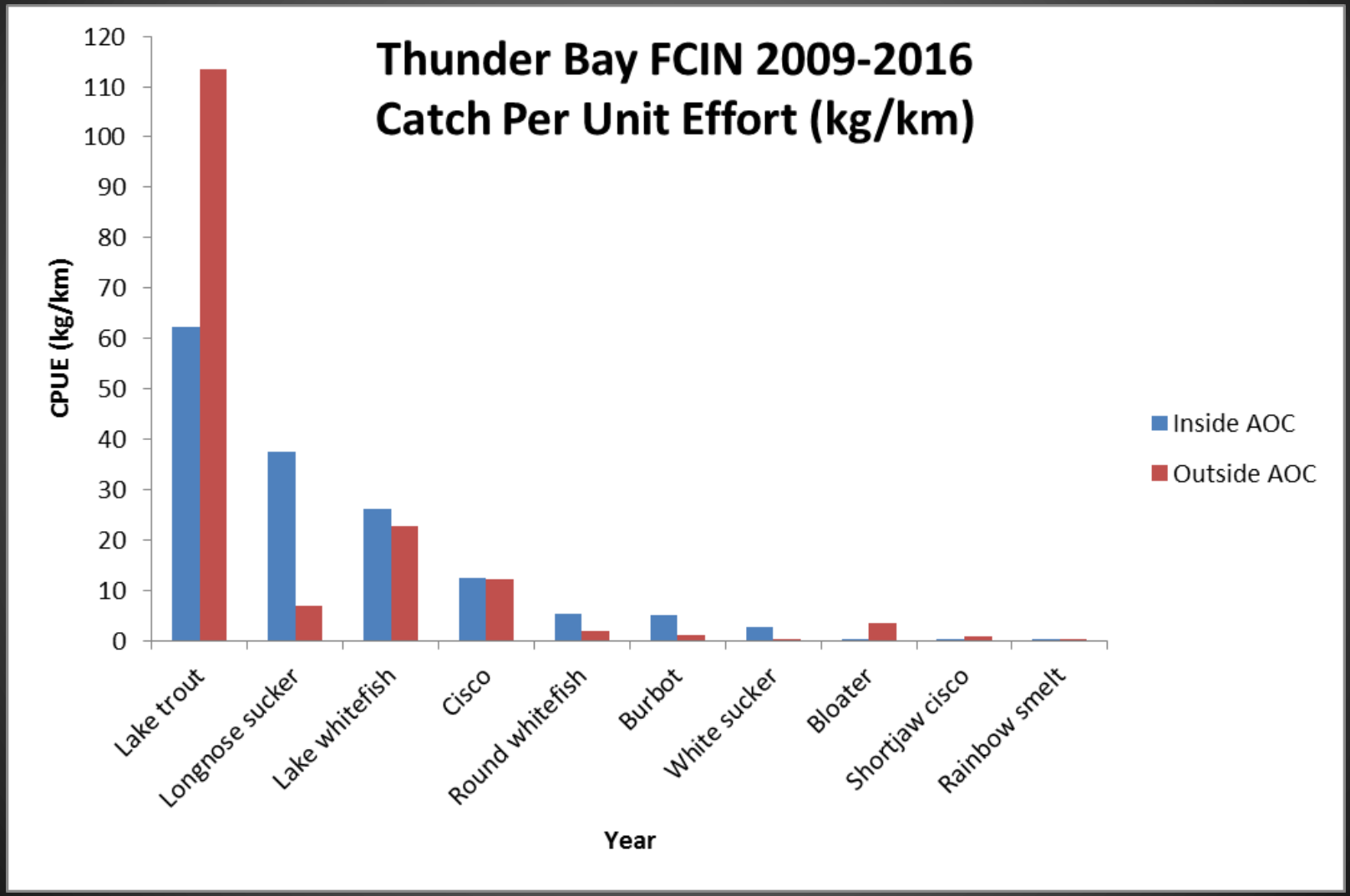
2016 Thunder Bay FCIN Sites

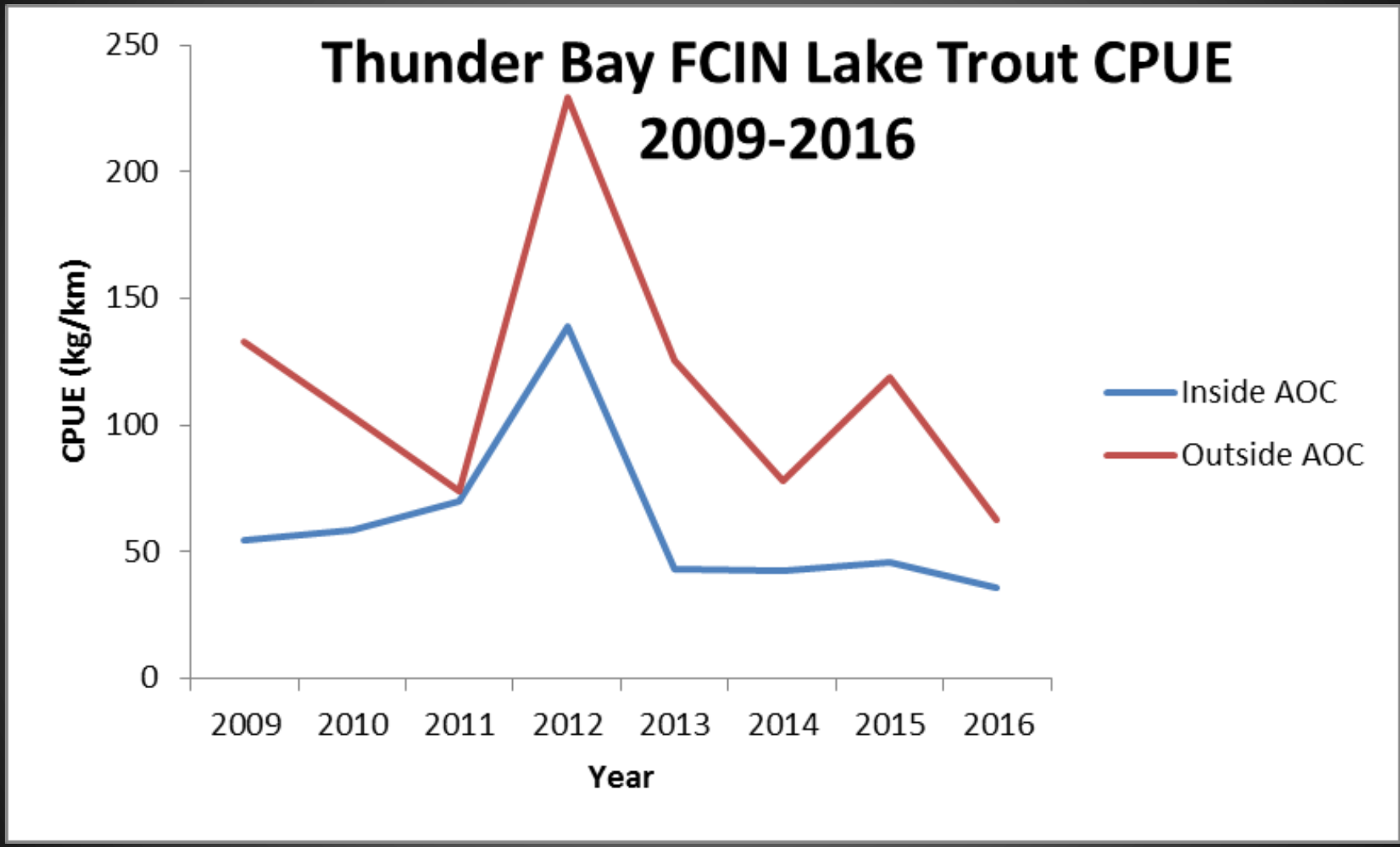


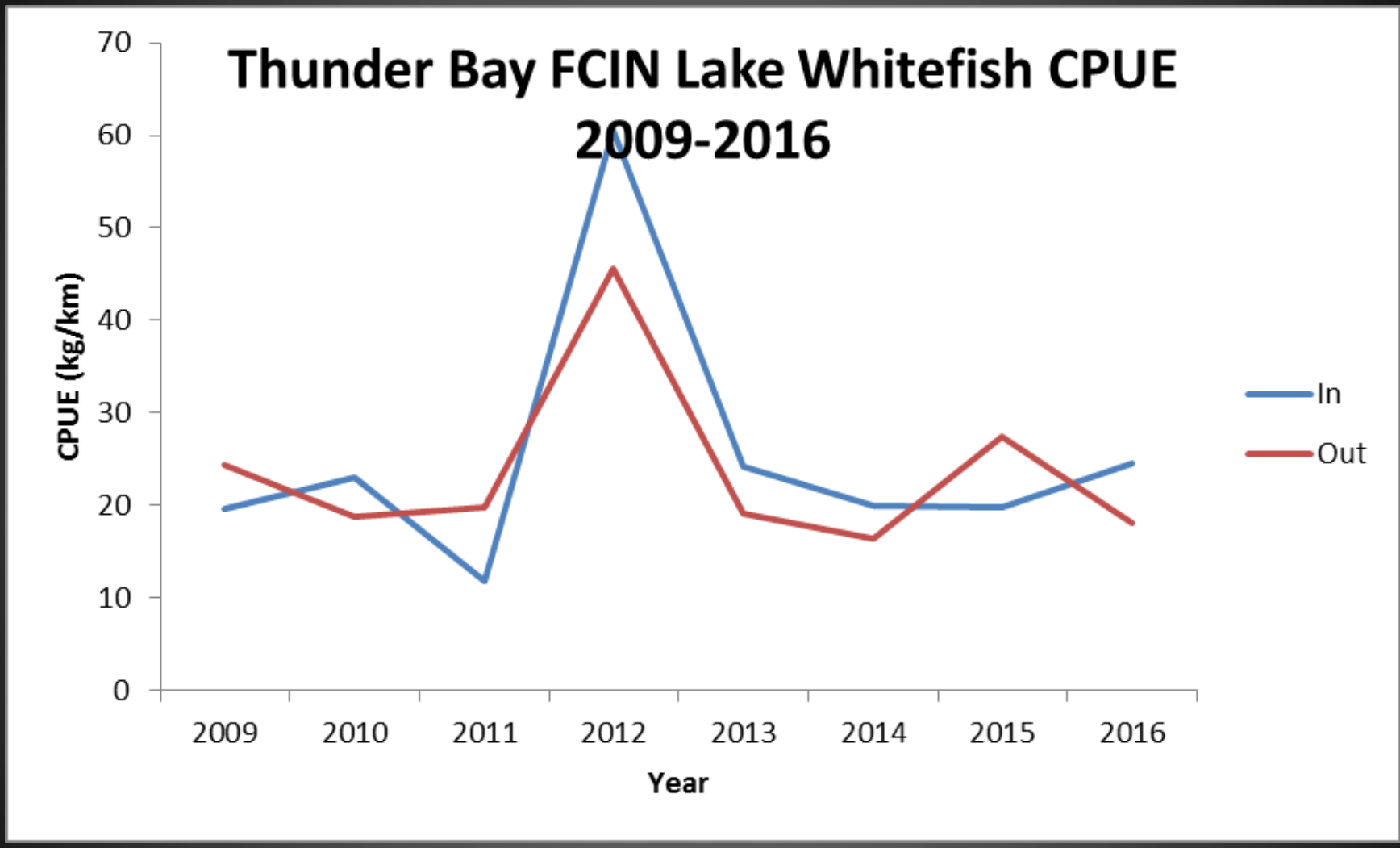
Catch Composition

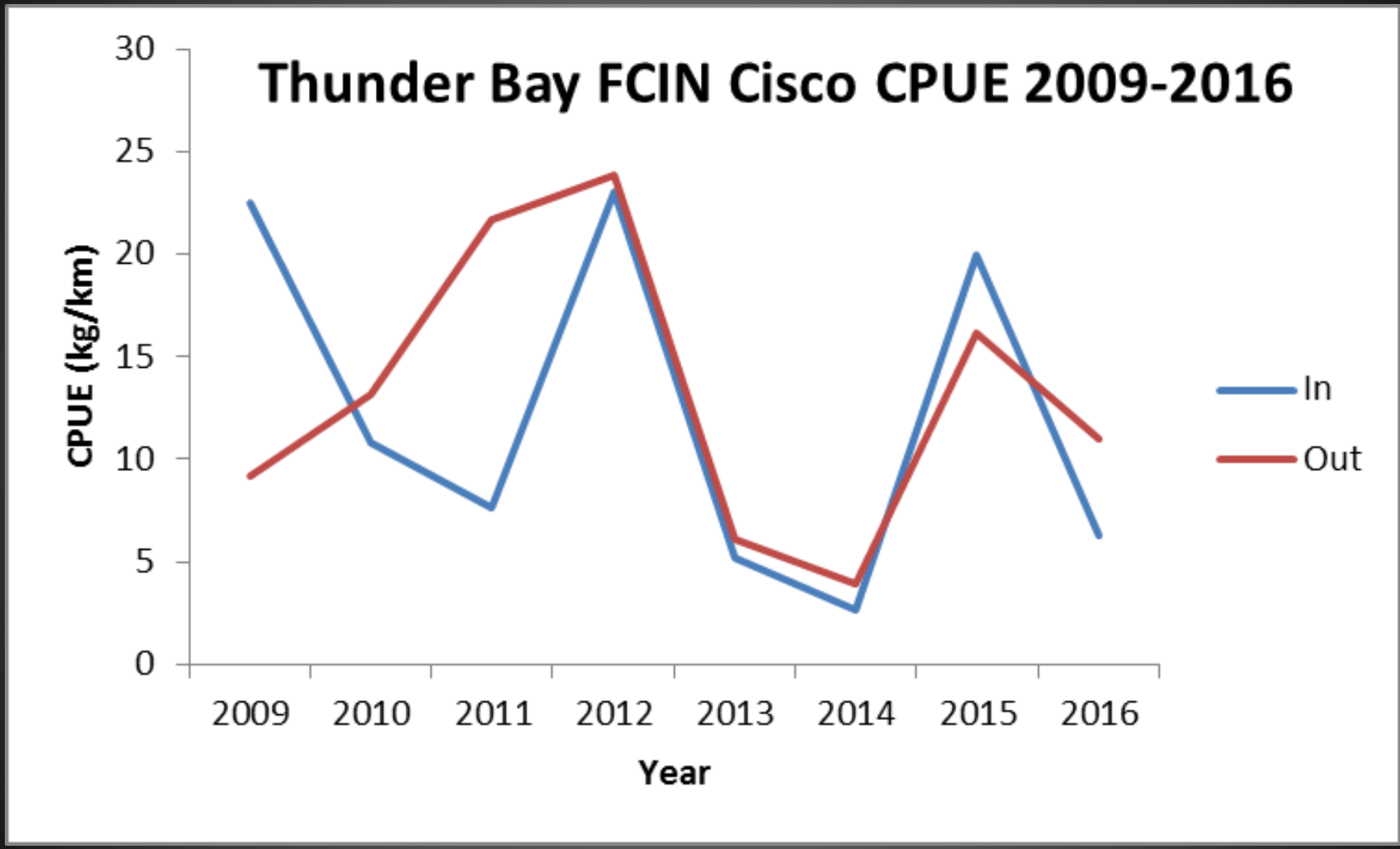


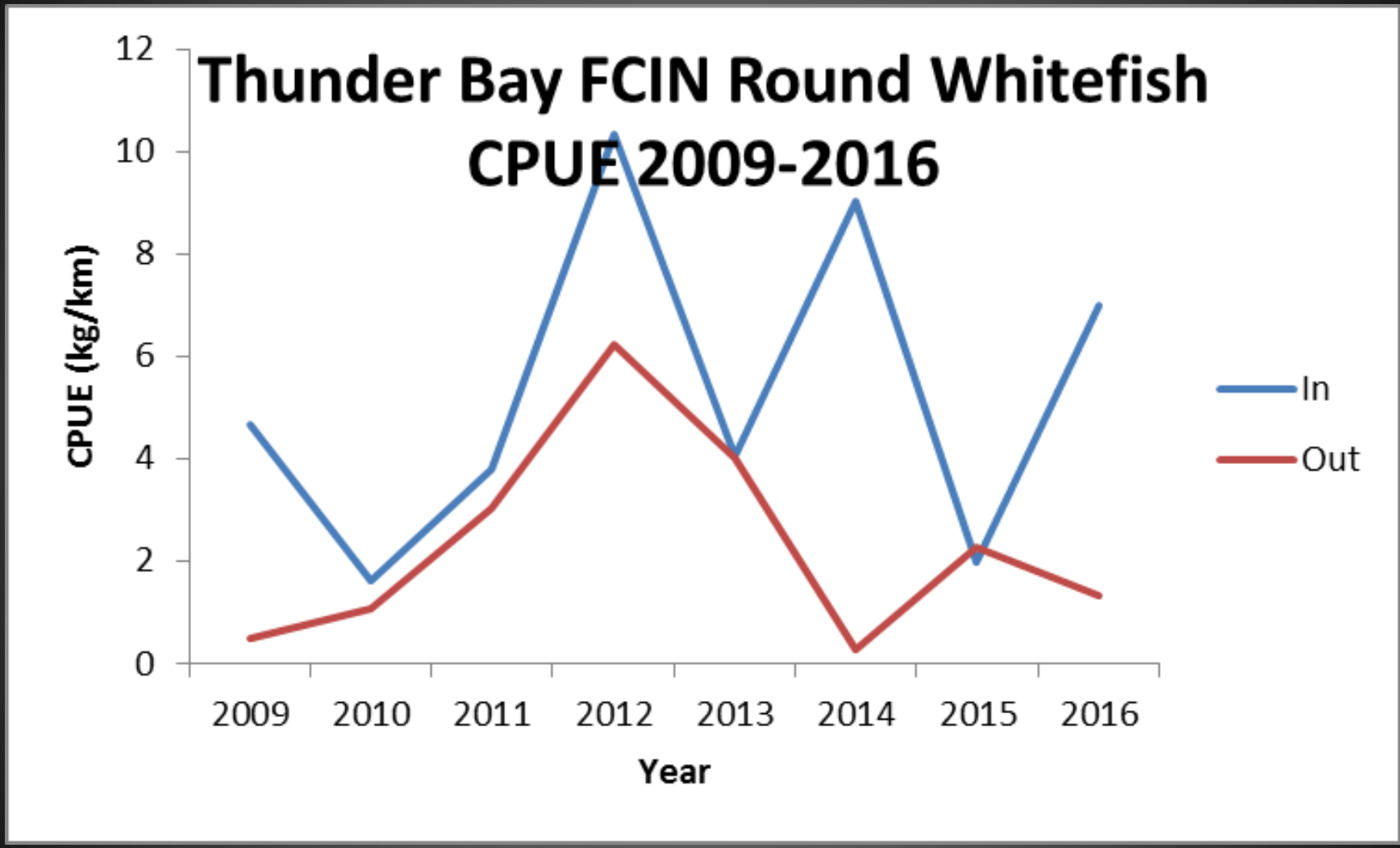
Relative Abundance

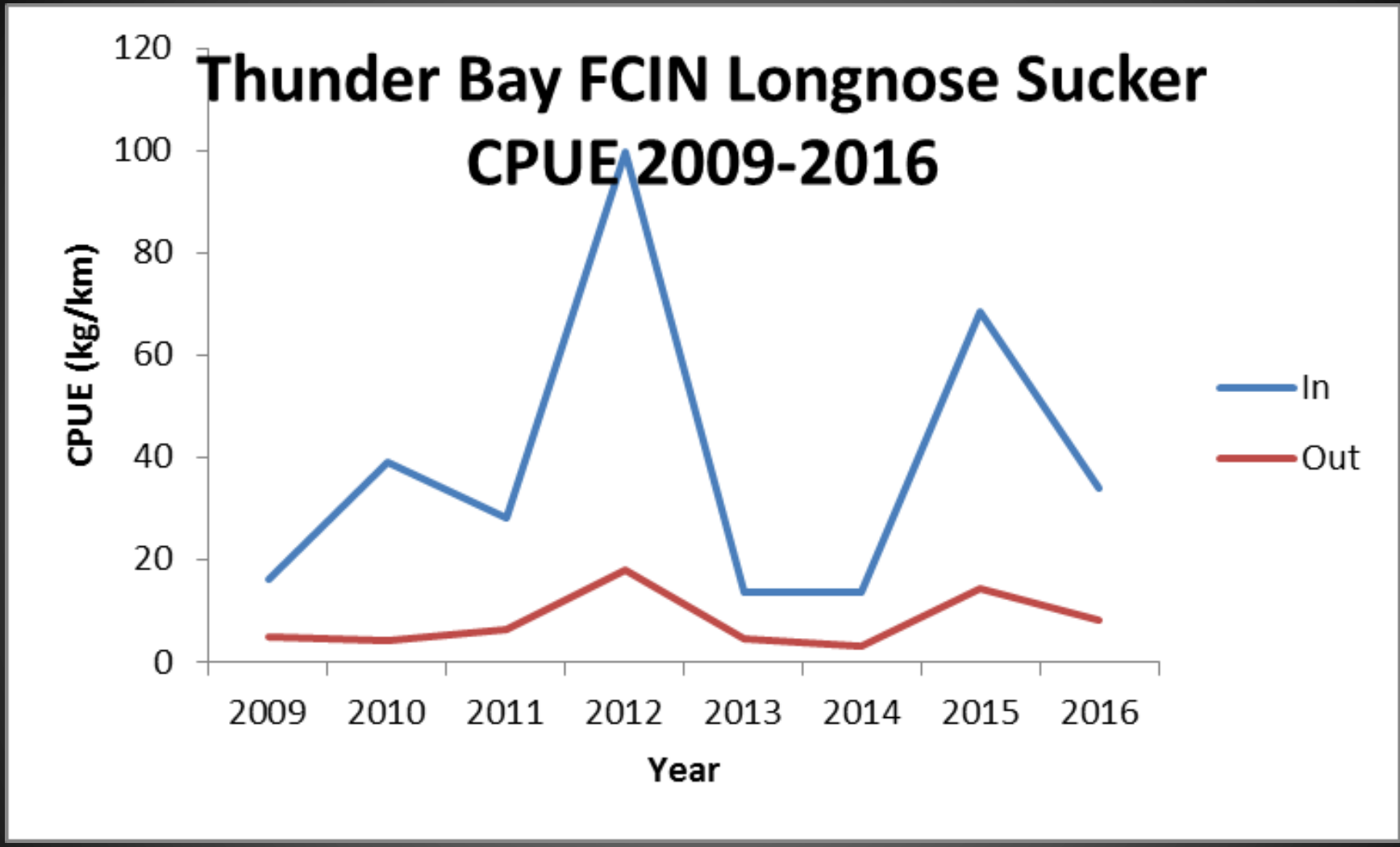



Thunder Bay FCIN Lake Trout CPUE
2009-2016
CPUE (kg/km)
250
200
150
100
50
0
2009
2010
2011
2012
2013
2014
2015
2016
Year
Inside AOC
Outside AOC

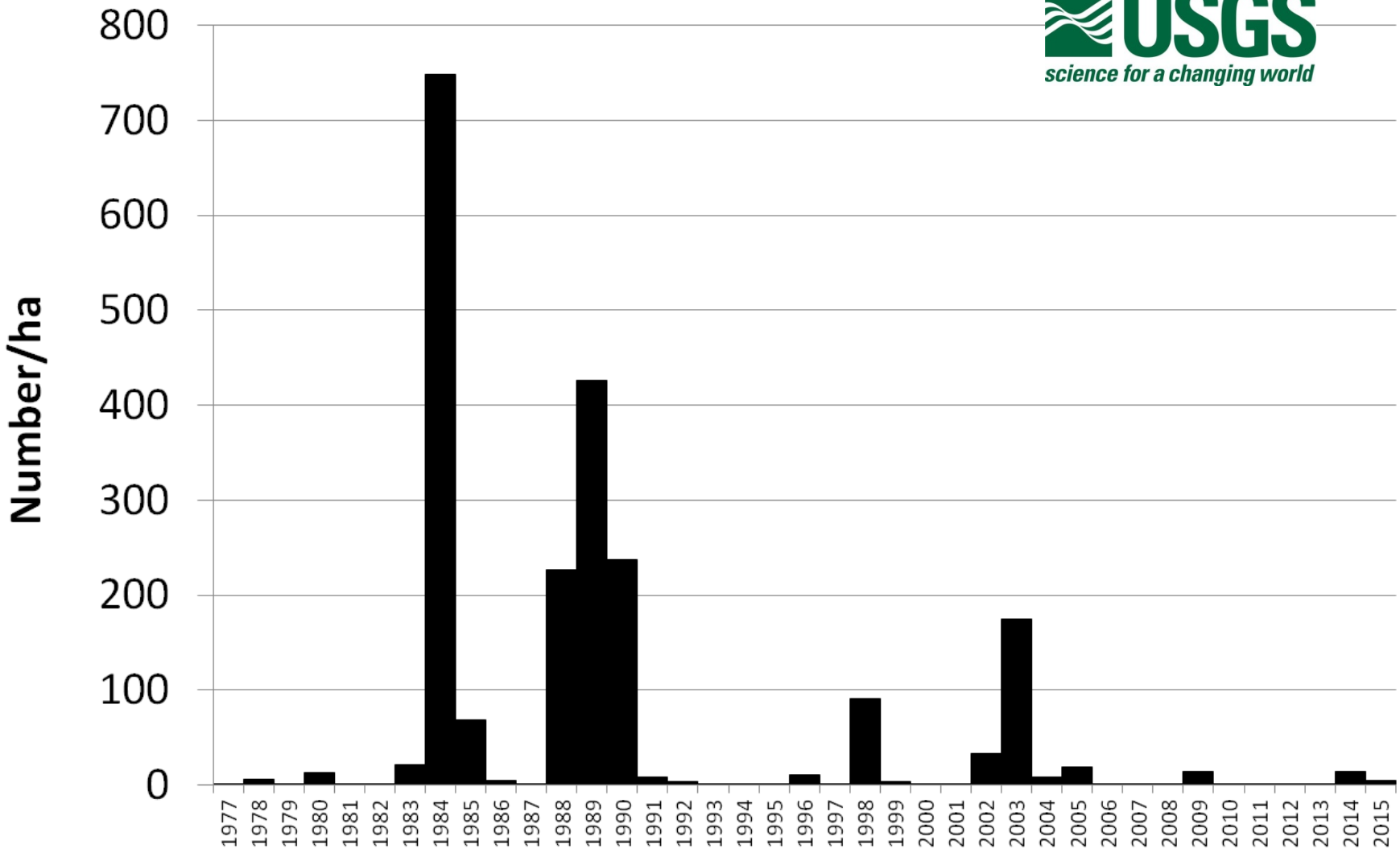

Thunder Bay FCIN Lake Whitefish CPUE
2009-2016
CPUE (kg/km)
70
60
50
40
30
20
10
0
2009
2010
2011
2012
2013
2014
2015
2016
Year
In
Out

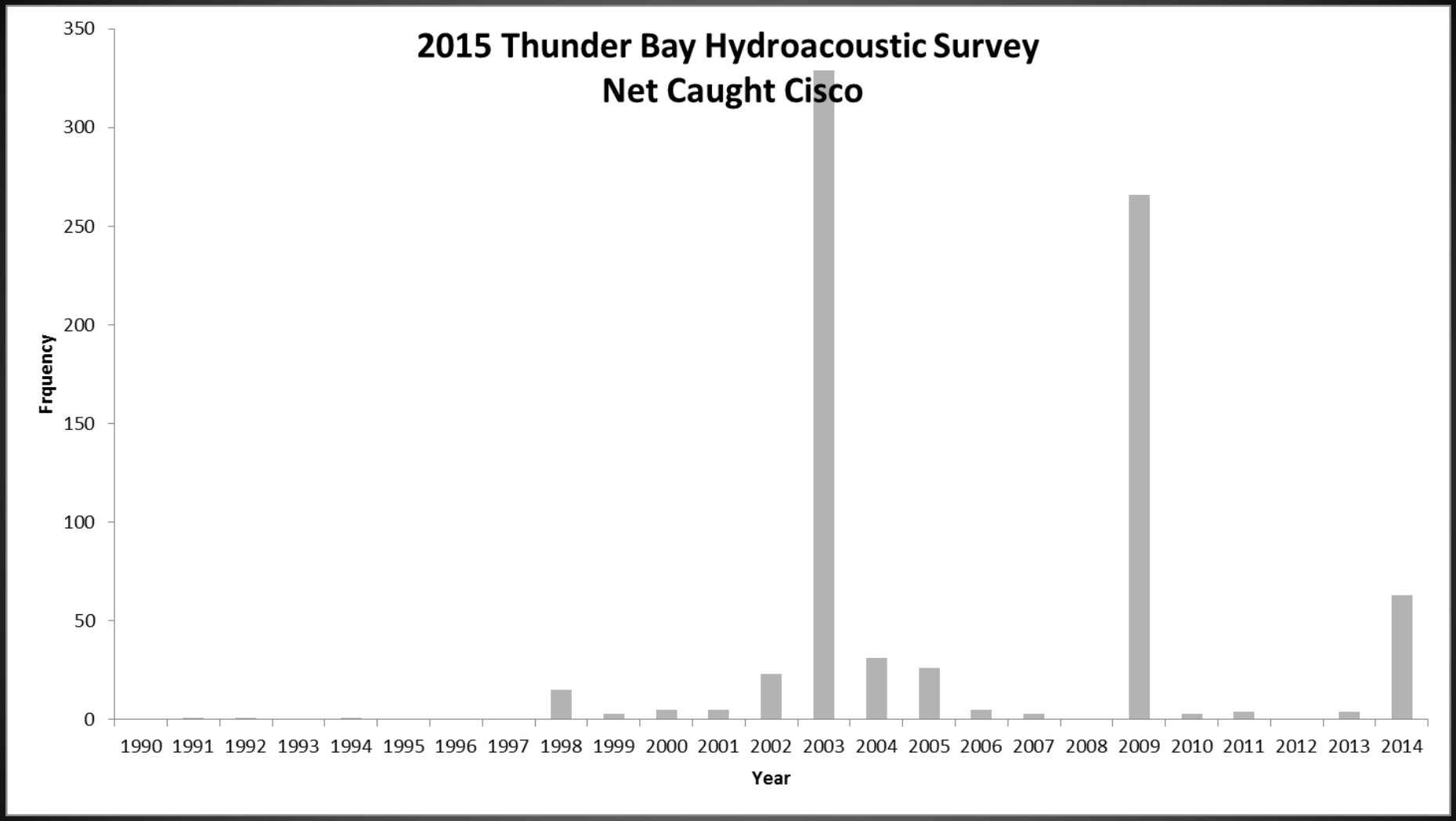

Thunder Bay FCIN Cisco CPUE 2009-2016
CPUE (kg/km)
30
25
20
15
10
5
0
2009
2010
2011
2012
2013
2014
2015
2016
Year
In
Out


Thunder Bay FCIN Round Whitefish
CPUE 2009-2016
CPUE (kg/km)
12
10
8
6
4
2
0
2009
2010
2011
2012
2013
2014
2015
2016
Year
In
Out


Thunder Bay FCIN Longnose Sucker
CPUE 2009-2016
CPUE (kg/km)
120
100
80
60
40
20
0
2009
2010
2011
2012
2013
2014
2015
2016
Year
In
Out

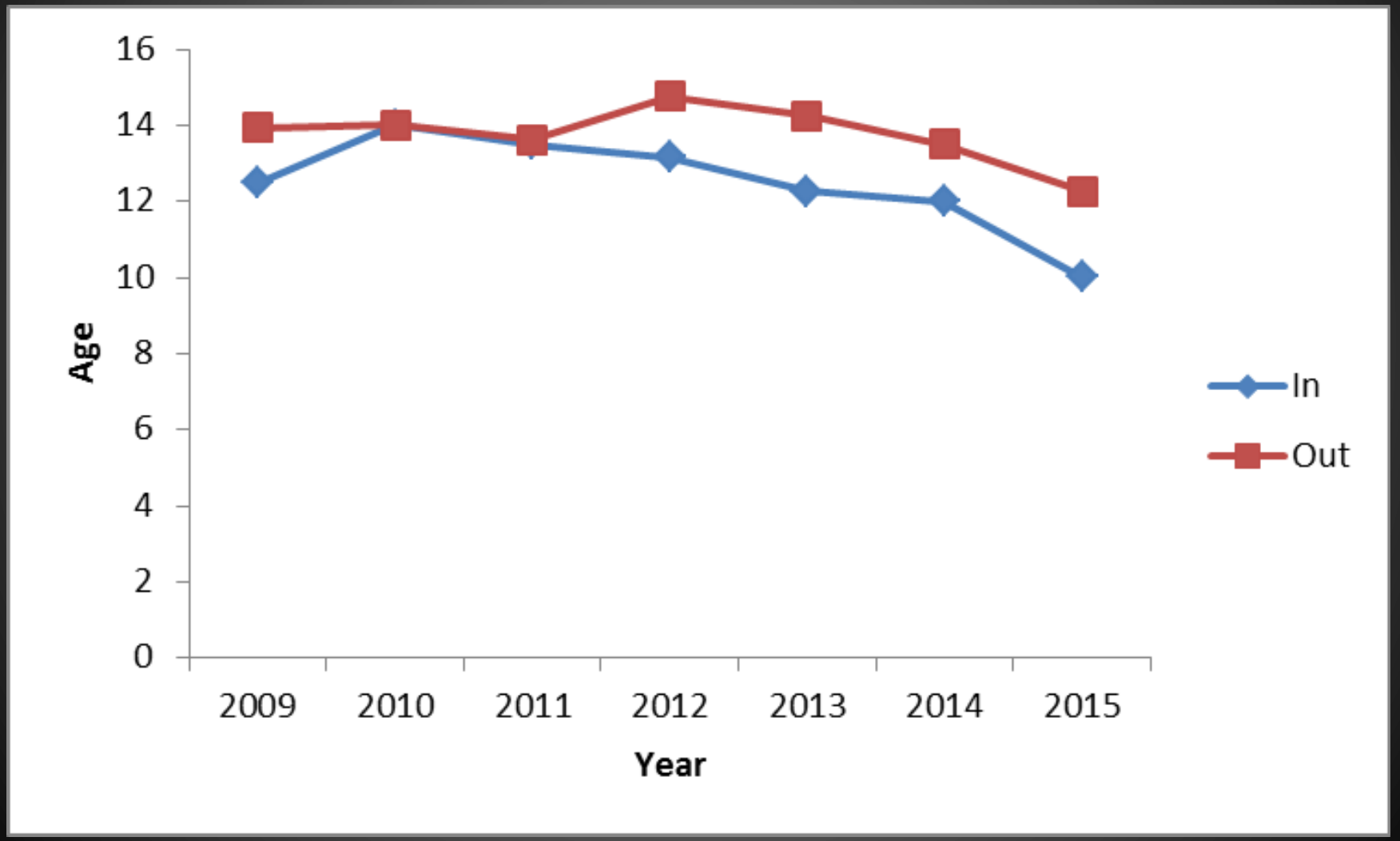
Cisco recruitment index (1977-2015)

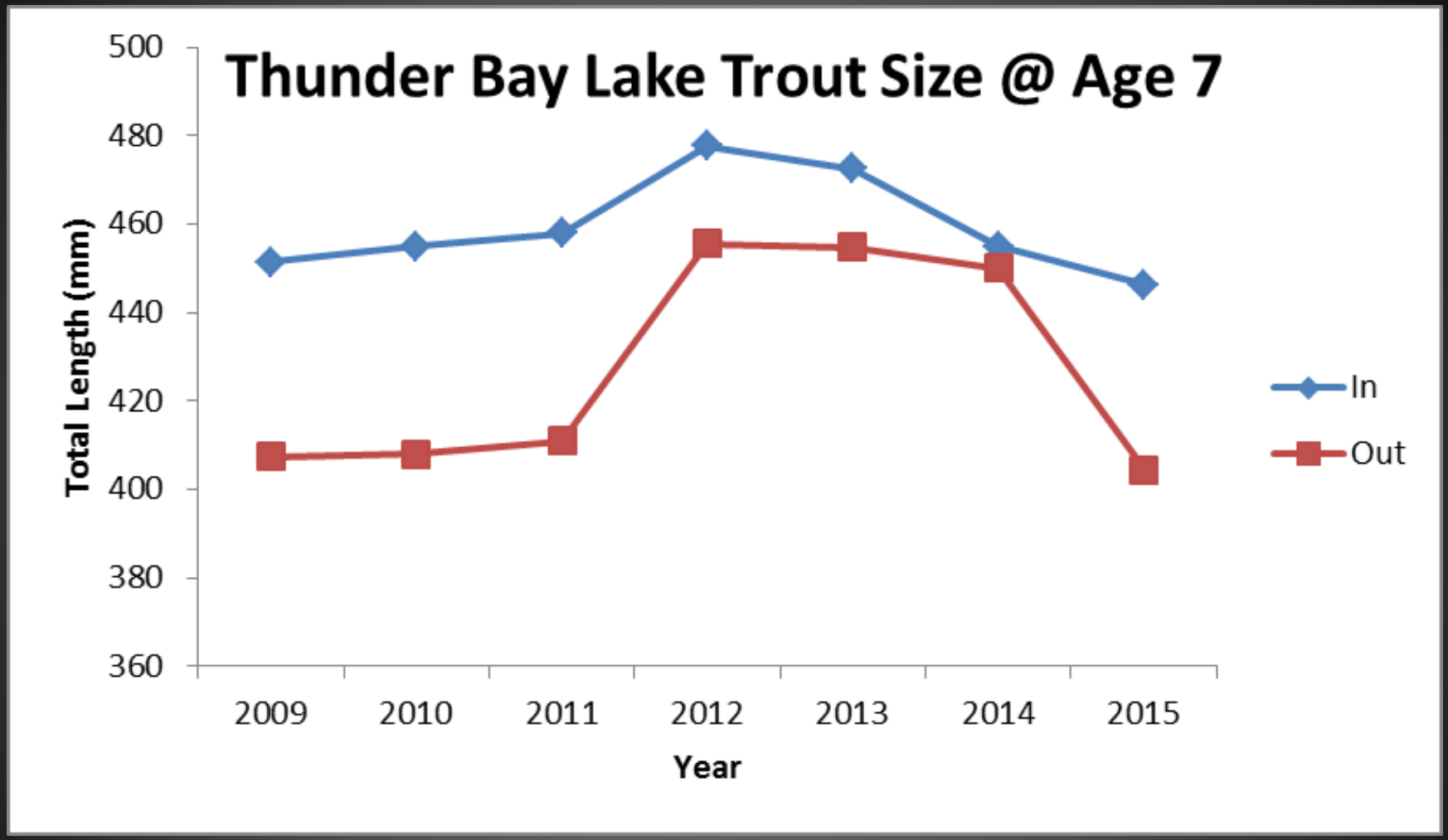


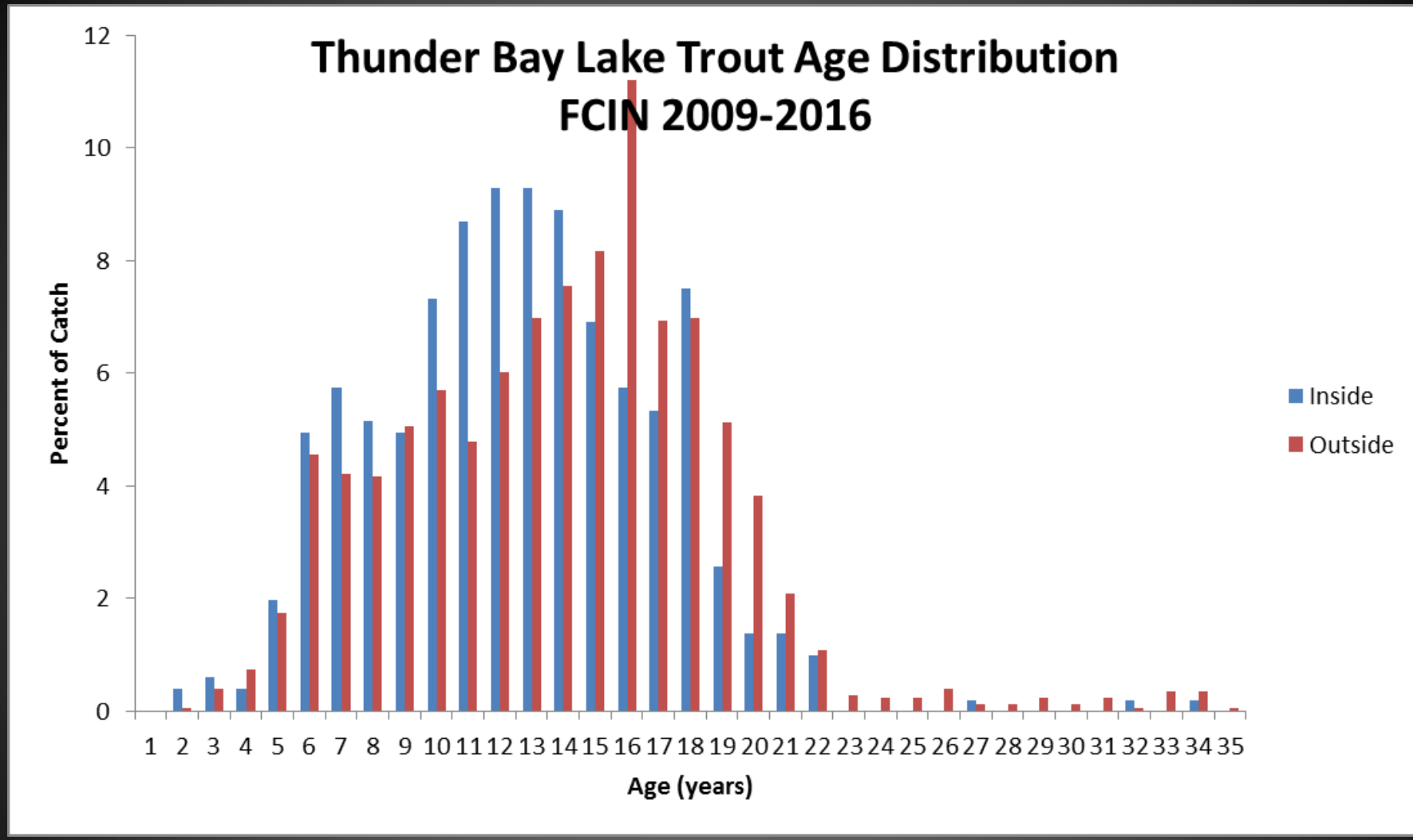

2015 Thunder Bay Hydroacoustic Survey
Net Caught Cisco
Frquency
350
300
250
200
150
100
50
0
1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014
Year

Lake Trout

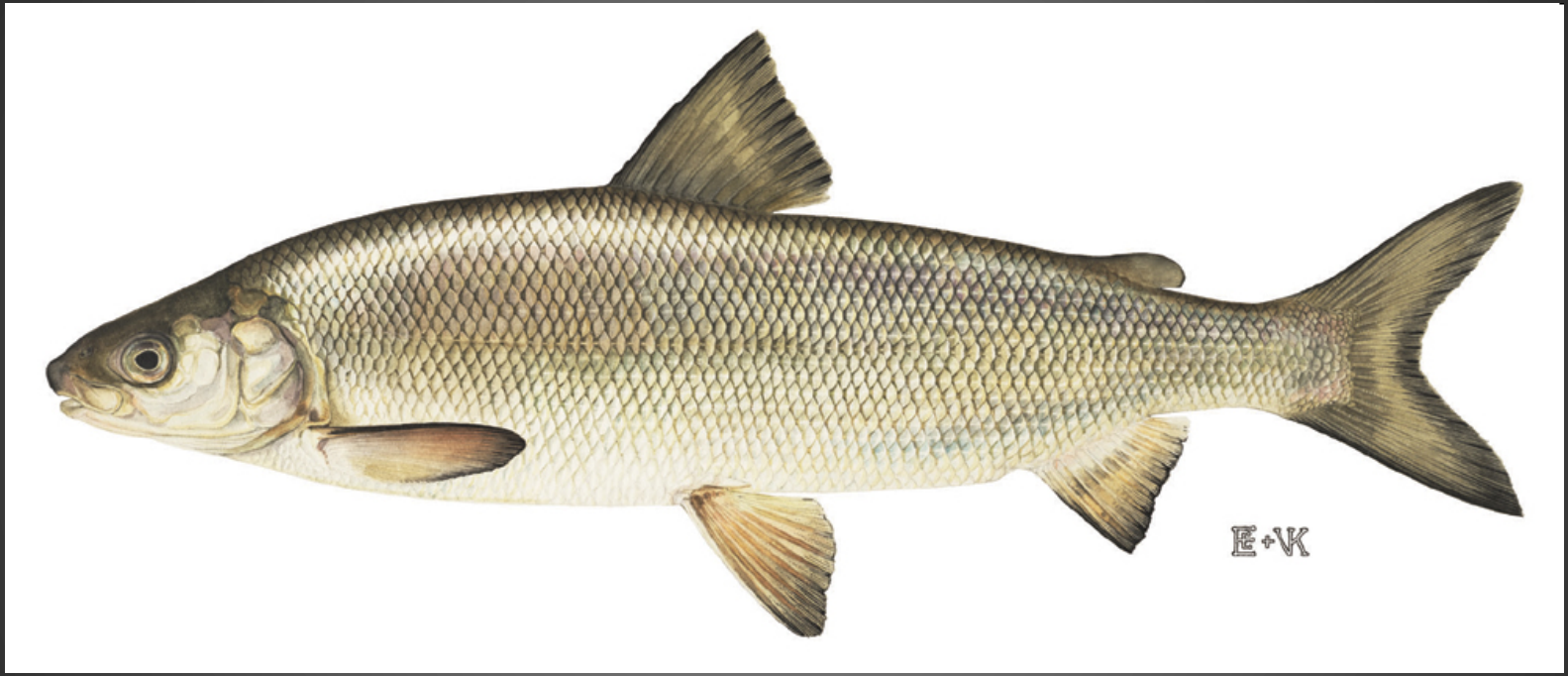
Mean Age of Lake Trout 2009-2015



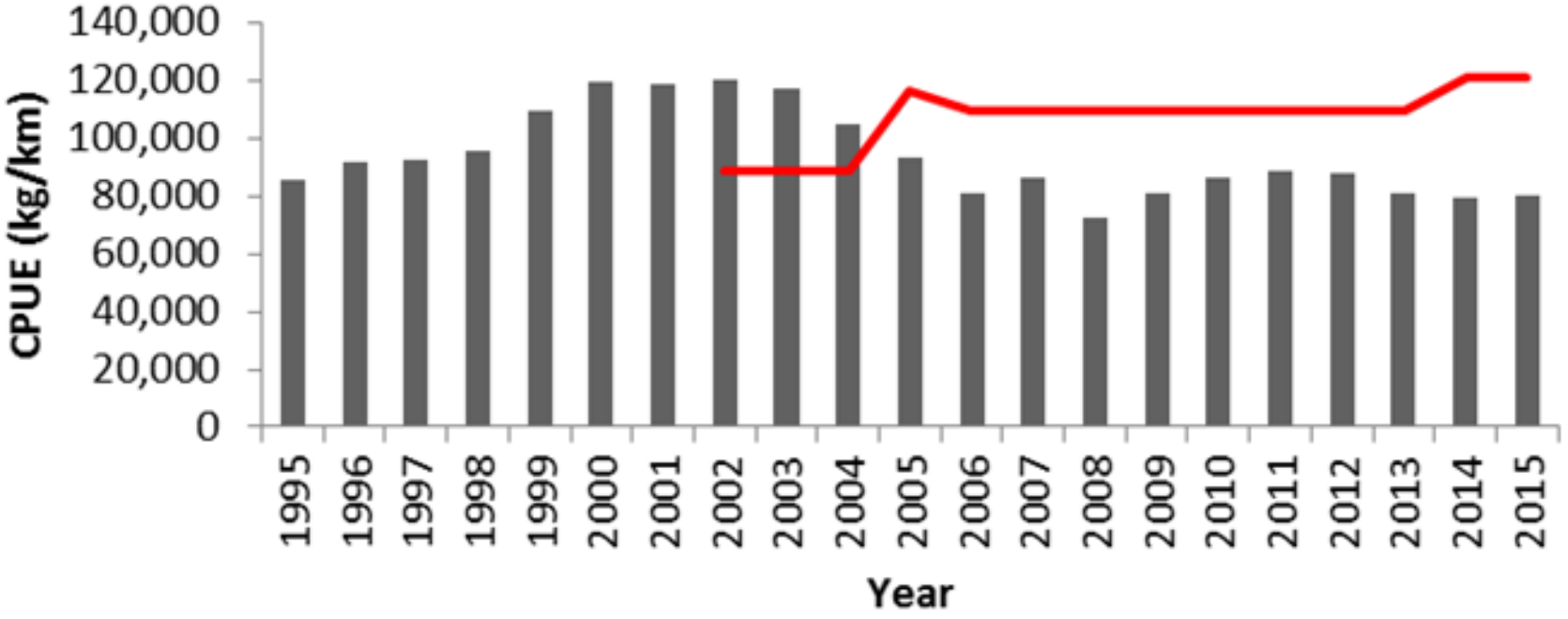

Thunder Bay Lake Trout Size @ Age 7
Total Length (mm)
500
480
460
440
420
400
380
360
2009
2010
2011
2012
2013
2014
2015
Year
In
Out


Thunder Bay Lake Trout Age Distribution
FCIN 2009-2016
Percent of Catch
0
2
4
6
8
10
12
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35
Age (years)
Inside
Outside

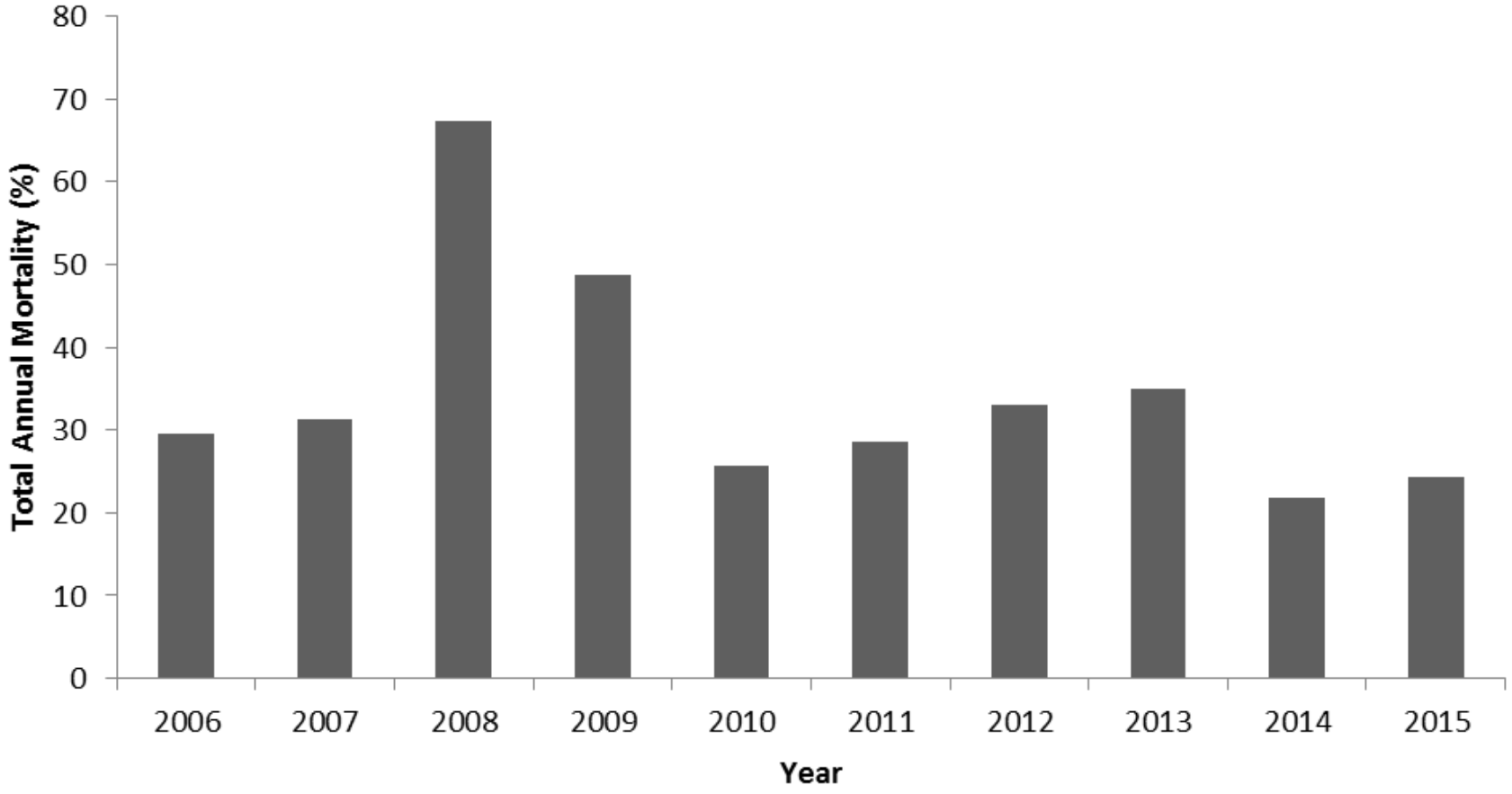
Lake Whitefish

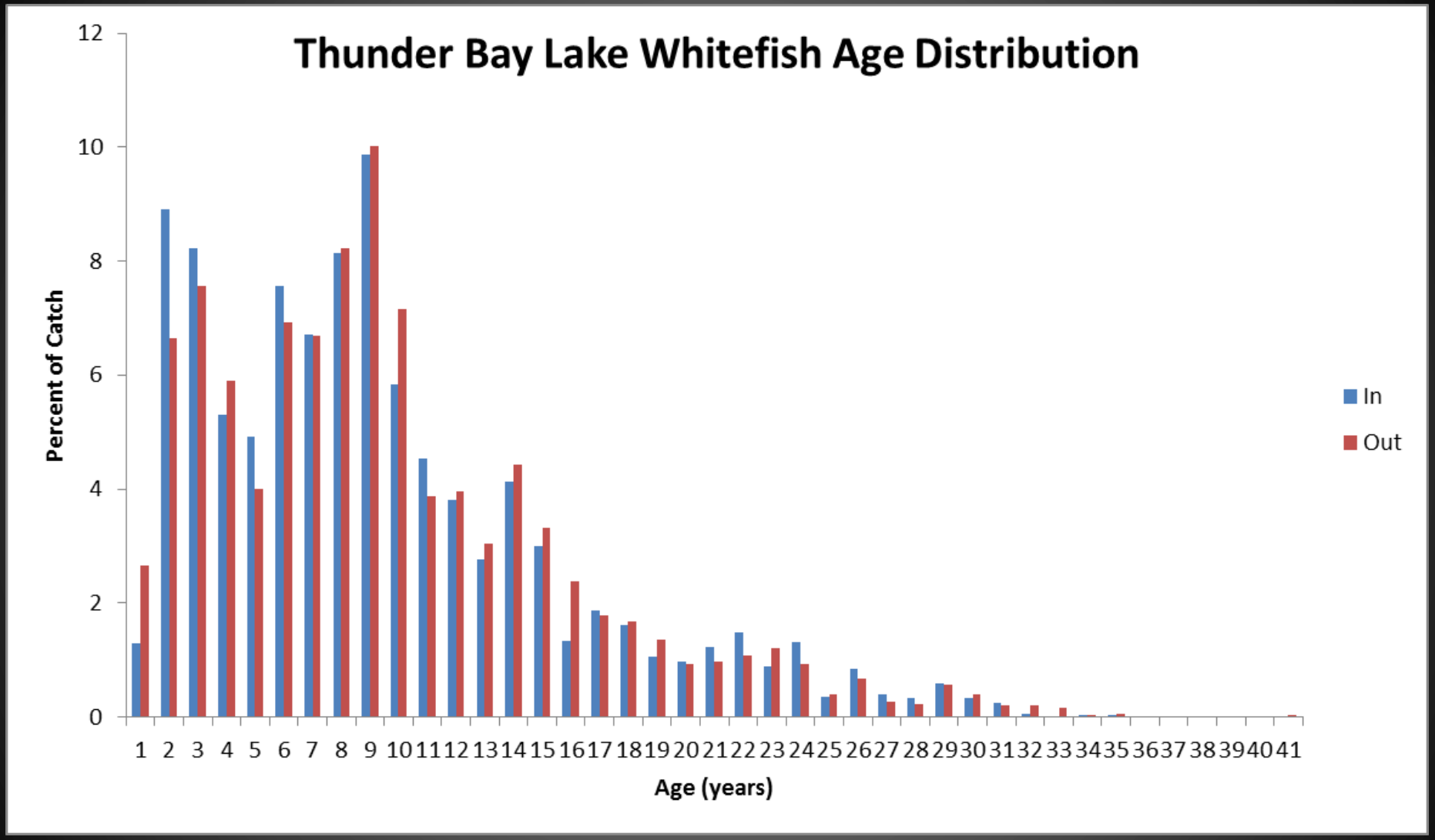


QMA S01 Lake Whitefish Commercial Harvest 1995-2015

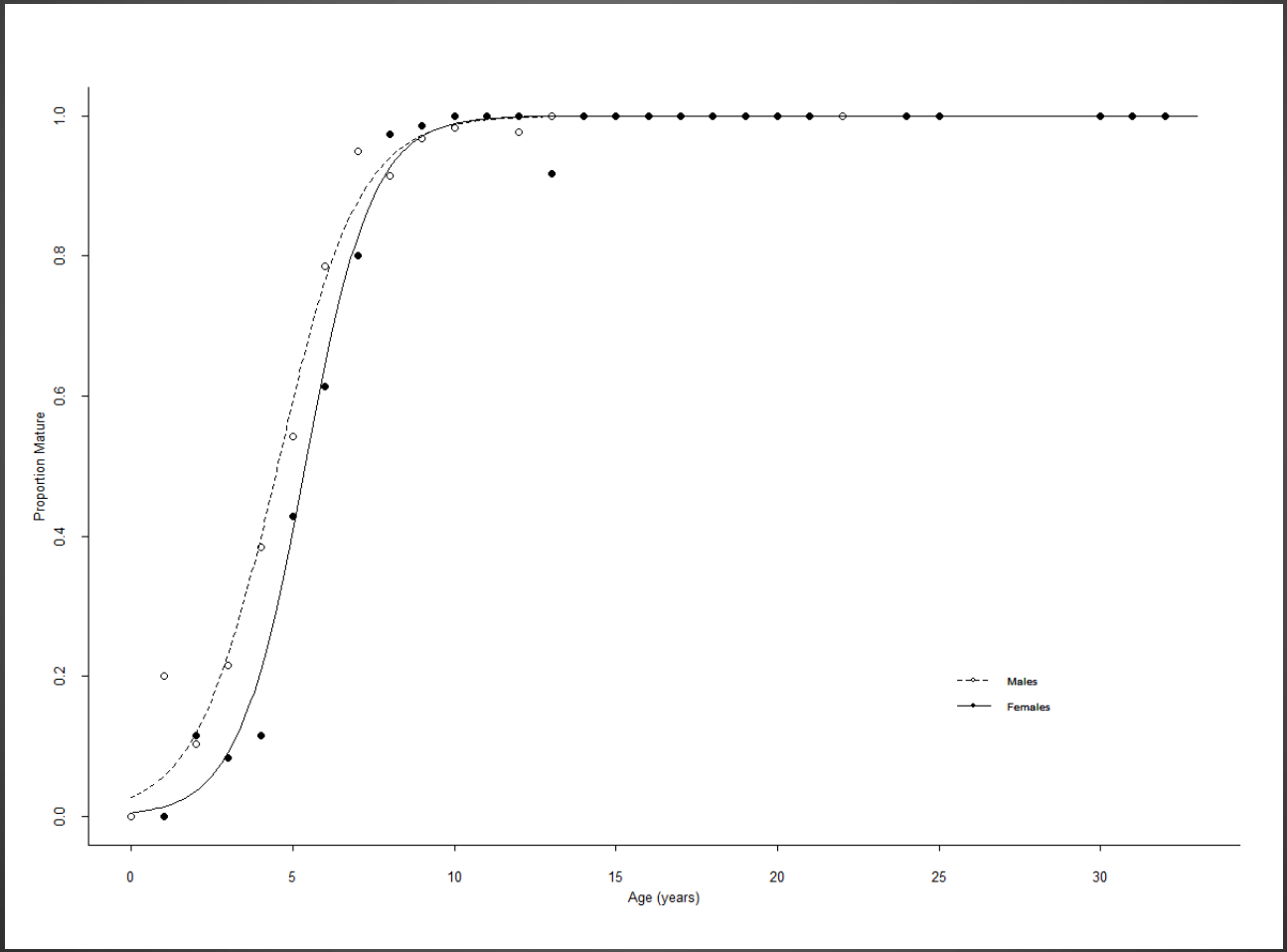


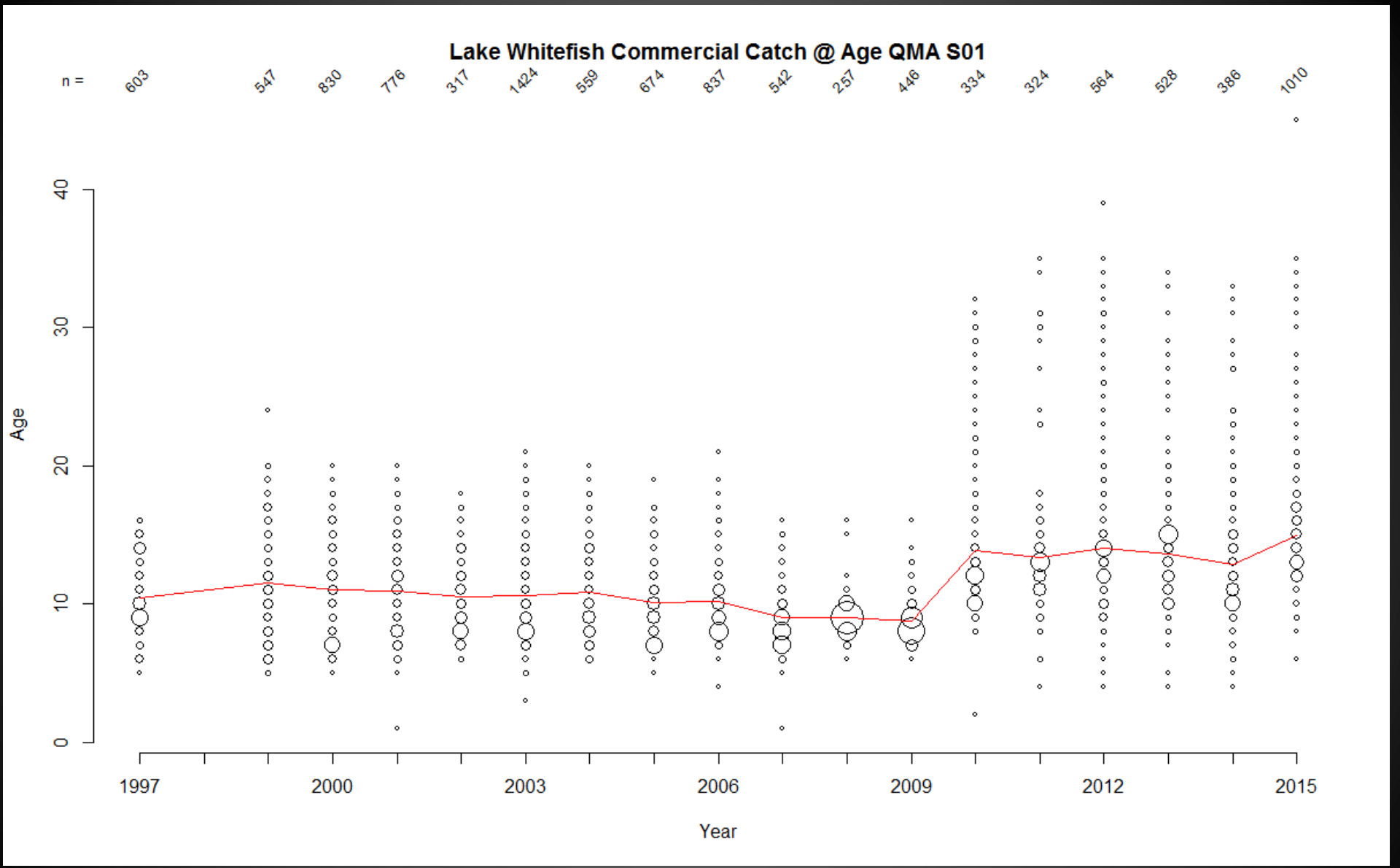
Lake Whitefish Total Annual Mortality
Thunder Bay Commercial Catch Sampling



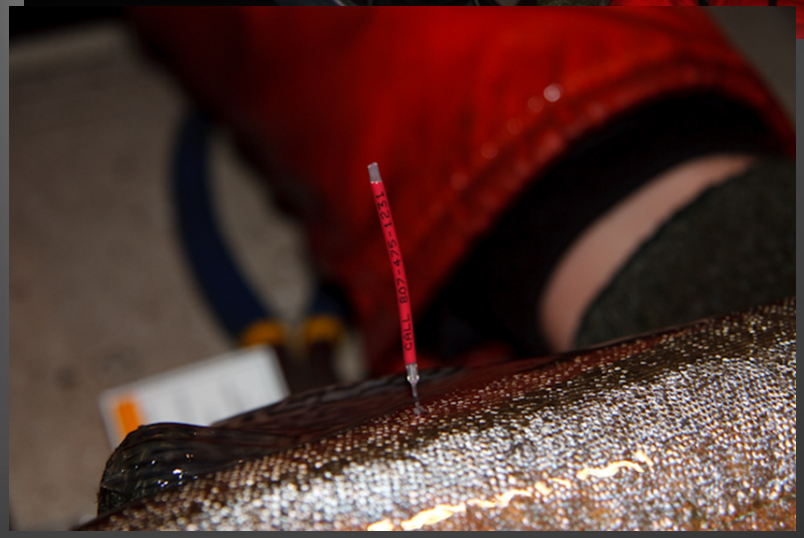

Thunder Bay Lake Whitefish Age Distribution
Percent of Catch
0
2
4
6
8
10
12
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41
Age (years)
In
Out

Lake Whitefish Age at 50% Maturity

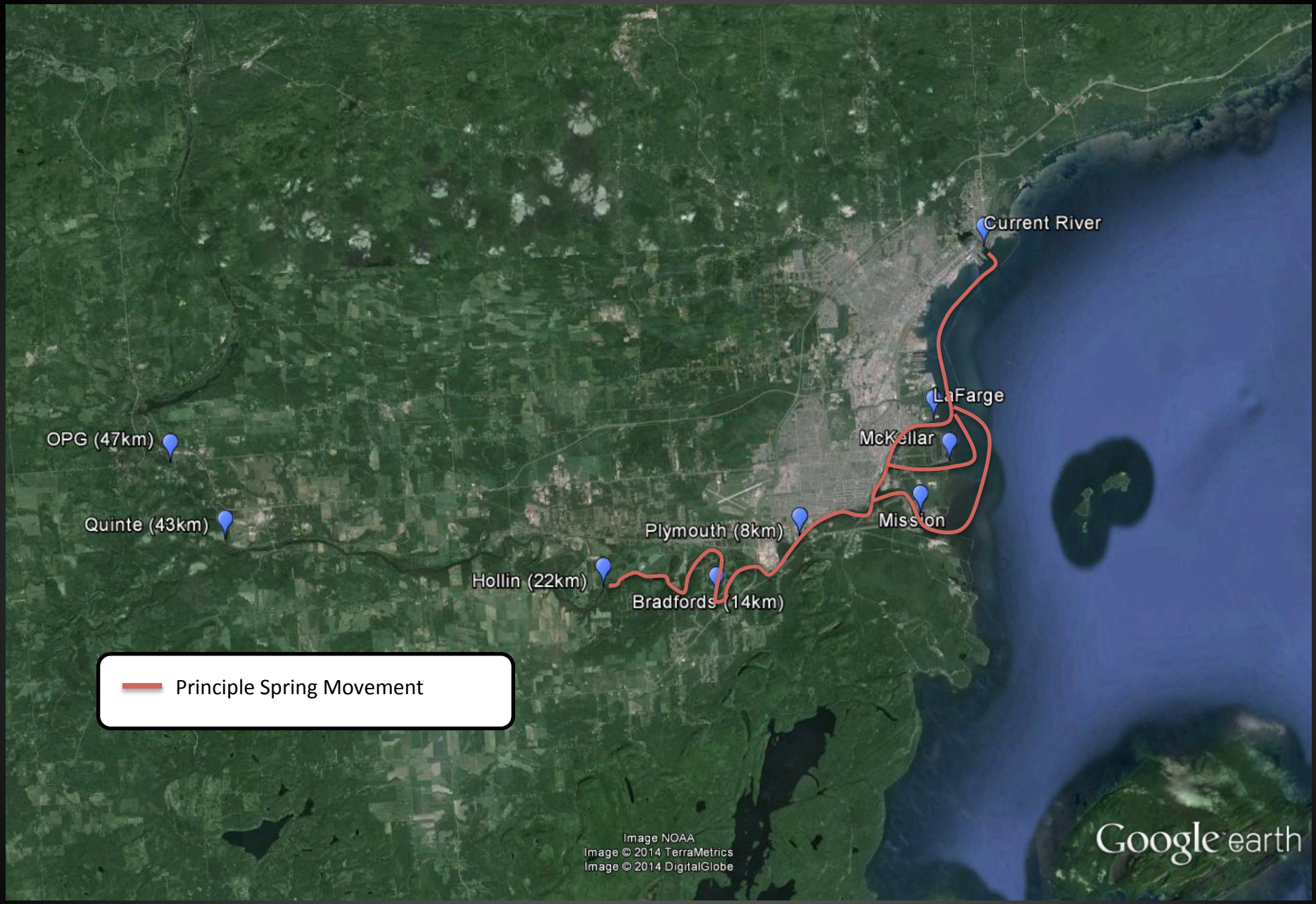


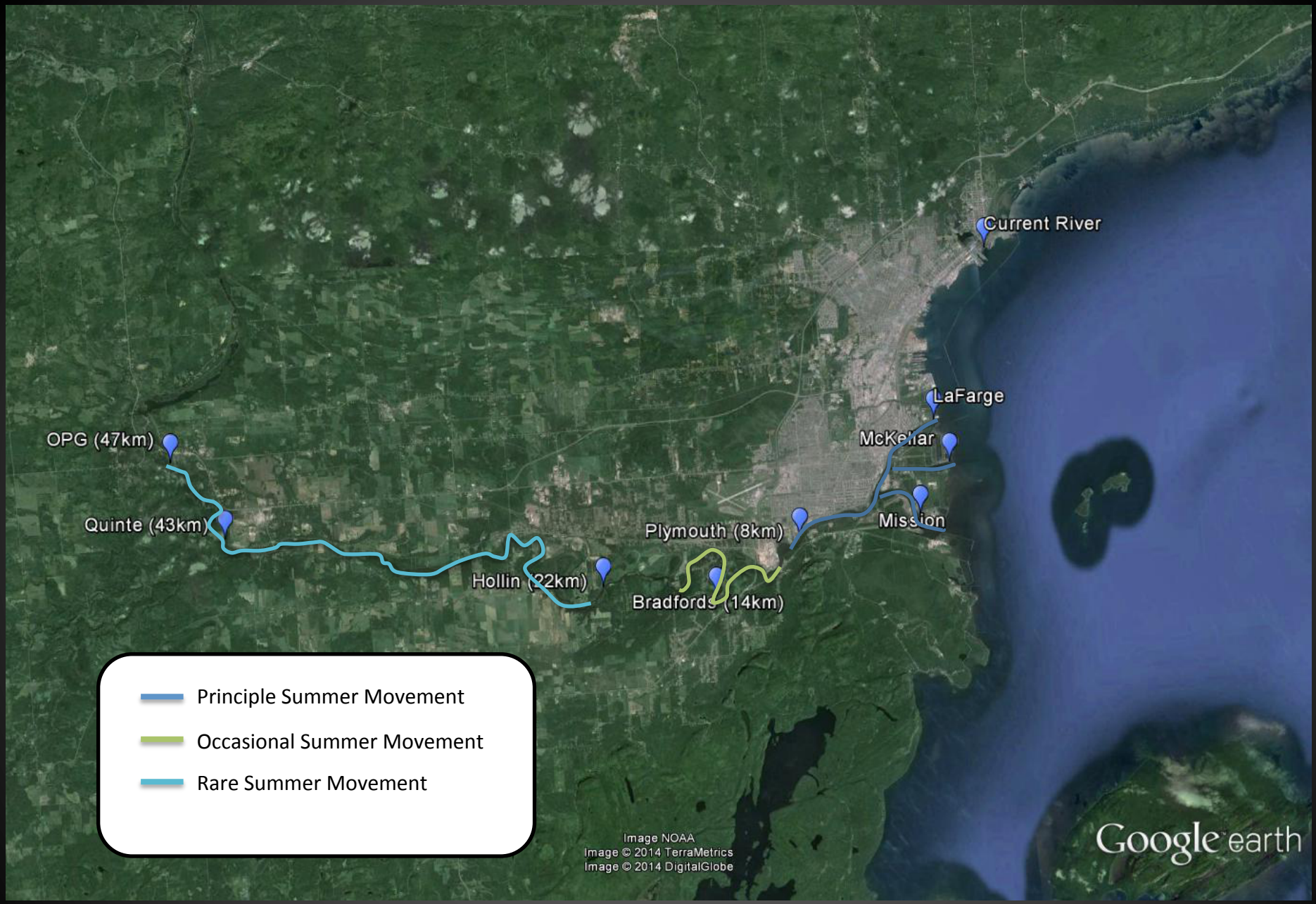

Lake Whitefish Commercial Catch @ Age QMA S01
n =
603
547
830
776
317
1424
559
674
837
542
257
446
334
324
564
528
386
1010
Age
0
10
20
30
40
1997
2000
2003
2006
2009
2012
2015
Year

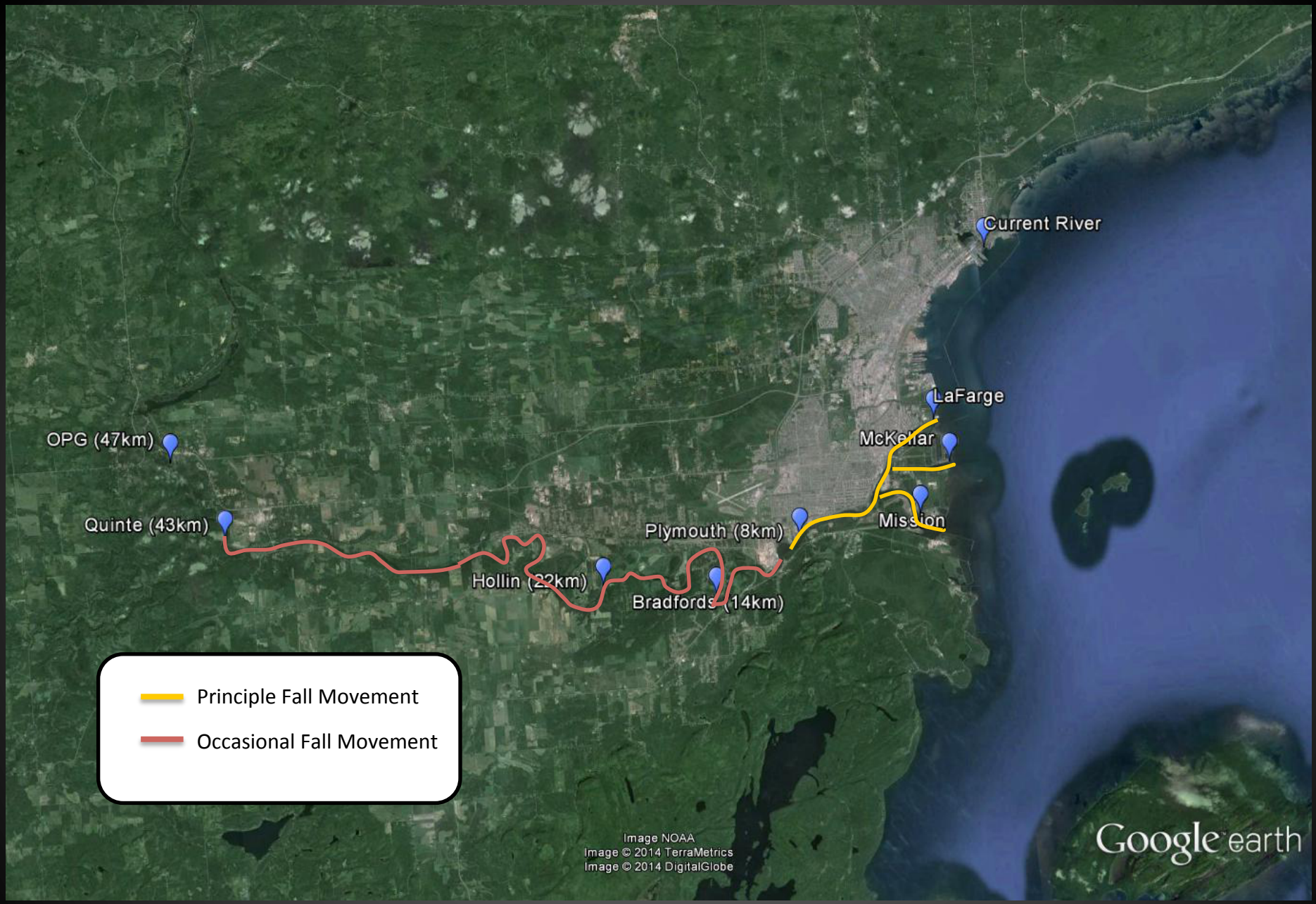
Brook Trout



Walleye


Current River
LaFarge
McKellar
Mission
OPG (47km)
Quinte (43km)
Plymouth (8km)
Hollin (22km)
Bradfords (14km)
Principle Spring Movement
Image NOAA
Image © 2014 TerraMetrics
Image © 2014 DigitalGlobe
Google earth


Current River
LaFarge
McKellar
Mission
OPG (47km)
Quinte (43km)
Plymouth (8km)
Hollin (22km)
Bradfords (14km)
Principle Summer Movement
Occasional Summer Movement
Rare Summer Movement
Image NOAA
Image © 2014 TerraMetrics
Image © 2014 DigitalGlobe
Google earth


Current River
LaFarge
McKellar
Mission
OPG (47km)
Quinte (43km)
Plymouth (8km)
Hollin (22km)
Bradfords (14km)
Principle Fall Movement
Occasional Fall Movement
Image NOAA
Image © 2014 TerraMetrics
Image © 2014 DigitalGlobe
Google earth

Lake Sturgeon

Summary

- Fish Community Status
- Lake Trout
- Lake Whitefish
- Brook Trout
- Walleye
- Sturgeon