

Appendix 1

Table A1.1. Description of functional groups used in Ecopath models for Lac la Biche.

Model group	Description
WALL1	Walleye (<i>Sander vitreus</i>) up to 50 mm TL
WALL2	Walleye from 51 to 350 mm TL
WALL3	Walleye 351 mm TL and larger
NRPK1	Northern pike (<i>Esox lucius</i>) up to 350 mm TL
NRPK2	Northern pike 351 mm TL and larger
YLPR1	Yellow perch (<i>Perca flavescens</i>) up to 100 mm TL
YPLR2	Yellow perch from 101 to 200 mm TL
YLPR3	Yellow perch 201 mm TL and larger
CISC1	Cisco (<i>Coregonus artedii</i>) up to 140 mm TL
CISC2	Cisco 141 mm TL and larger
LKWH1	Lake whitefish (<i>Coregonus clupeaformis</i>) up to 260 mm TL
LKWH2	Lake whitefish 261 mm TL and larger
BURB1	Burbot (<i>Lota lota</i>) up to 350 mm TL
BURB2	Burbot 351 mm TL and larger
Suckers	White sucker (<i>Catostomus commersonii</i>) and longnose sucker (<i>Catostomus catostomus</i>), all sizes. Mostly white sucker.
Sticklebacks	Ninespine stickleback (<i>Pungitius pungitius</i>) and brook stickleback (<i>Culaea inconstans</i>). Mostly ninespine stickleback.
Small Fish	Spottail shiners (<i>Notropis hudsonius</i>), trout-perch (<i>Percopsis omiscomaycus</i>), and Iowa darters (<i>Etheostoma exile</i>). Mostly spottail shiners.
DCCO	Double-crested cormorant (<i>Phalacrocorax auritus</i>)
AWPE	American white pelican (<i>Pelecanus erythrorhynchus</i>)
Pisc. Birds	Piscivorous waterbirds
Non-P. Birds	Non-piscivorous waterbirds

Chiro. & Dip.	Chironomids and Dipterans
Amphi.	Amphipods
Mollusc & Gastro.	Molluscs and gastropods
Inverts.	All other aquatic invertebrates
Litt. Zoopl.	Littoral zooplankton
Pel. Zoopl.	Pelagic zooplankton
Cyano.	Cyanobacteria
Phyto.	Phytoplankton
SAV	Submerged aquatic vegetation including: macrophytes, periphytes, and epiphytes

Table A1.2. Range of biomass ($t \cdot km^{-2}$) values used in the balanced Ecopath models for each of the four modeled eras (1800, 1900, 1965, 2005).

Functional Group	Biomass (t/km^2)			
	1800	1900	1965	2005
WALL1 stocked			0.000 - 0.000	0
WALL2 stocked			0.019 - 0.019	0.002
WALL3 stocked			0.169 - 0.169	0.001
WALL1	0.000 - 0.000	0.000 - 0.0002	0.000 - 0.000	0.000 - 0.003
WALL2	0.099 - 0.247	0.101 - 0.801	0.001 - 0.015	0.000 - 0.048
WALL3	2.25 - 3.76	2.24 - 3.77	0.006 - 0.061	0.000 - 0.210
NRPK1	0.030 - 0.057	0.024 - 0.089	0.011 - 0.079	0.013 - 0.102
NRPK2	1.90 - 5.01	1.42 - 8.70	0.623 - 2.66	0.910 - 2.00
YLPR1	0.793 - 4.48	0.764 - 4.66	0.993 - 2.37	0.495 - 10.4
YLPR2	0.382 - 2.87	0.533 - 3.94	0.963 - 5.97	0.539 - 20.0
YLPR3	1.10 - 7.60	0.900 - 8.60	0.451 - 5.43	0.096 - 10.5
CISC1	0.38 - 1.67	0.331 - 2.29	0.254 - 0.765	0.656 - 9.37
CISC2	3.50 - 10.5	4.04 - 18.00	1.50 - 6.00	4.63 - 10.6
LKWH1	0.654 - 2.06	0.301 - 2.55	0.124 - 2.22	0.113 - 0.469
LKWH2	6.50 - 13.8	2.53 - 12.6	0.900 - 5.41	0.841 - 1.10
BURB1	0.122 - 0.431	0.140 - 0.853	0.087 - 0.265	0.178 - 0.620
BURB2	0.650 - 2.43	0.726 - 3.00	0.307 - 0.948	0.368 - 0.762
Suckers	2.50 - 6.50	2.01 - 6.58	3.50 - 8.20	1.10 - 3.50
Stickle.	0.801 - 2.90	0.865 - 5.20	0.329 - 1.27	1.00 - 3.13
Small Fishes	0.325 - 2.15	0.322 - 2.65	0.069 - 1.00	0.102 - 1.08
DCCO	0.210 - 0.210	0.210 - 0.073	0.006 - 0.009	0.290 - 0.309
AWPE	0.005 - 0.005	0.005 - 0.006	0.006 - 0.009	0.006 - 0.040

Pisc. Birds	0.004 - 0.006	0.004 - 0.006	0.003 - 0.003	0.008 - 0.008
Non-Pisc. Birds	0.010 - 0.014	0.010 - 0.014	0.011 - 0.011	0.019 - 0.019
Chiro. & Dip.	5.19 - 25.00	5.00 - 25.0	7.13 - 24.9	3.96 - 40.4
Amphi.	0.906 - 4.00	0.901 - 4.20	0.774 - 4.99	1.60 - 8.96
Molluscs & Gastro.	1.19 - 4.00	1.21 - 4.22	0.768 - 4.08	0.553 - 46.6
Other Inverts	0.973 - 4.00	0.978 - 4.35	0.580 - 3.85	1.23 - 32.9
Litt. Zoopl.	0.357 - 1.40	0.349 - 0.358	0.380 - 0.392	0.374 - 0.374
Pel. Zoopl.	0.154 - 5.00	0.139 - 5.00	0.259 - 3.85	0.120 - 7.51
Cyanobacteria	2.18 - 4.36	2.18 - 4.36	2.16 - 4.48	4.48 - 8.72
Phytoplankton	3.18 - 6.36	3.18 - 6.38	3.15 - 5.24	5.92 - 12.0
Macrophytes	0.311 - 115	0.312 - 115	0.266 - 115	0.128 - 115
Detritus	0.500 - 0.500	0.005 - 0.500	0.005 - 0.600	0.005 - 10.0

Table A1.3. Range of production/biomass (year⁻¹) values used in the balanced Ecopath models for each of the four modeled eras (1800, 1900, 1965, 2005).

Functional Group	Production/Biomass (/year)			
	1800	1900	1965	2005
WALL1 stocked			5.5	6.00
WALL2 stocked			0.6	2.40
WALL3 stocked			0.25	0.40
WALL1	4.90 - 11.20	2.80 - 13.00	5.00 - 11.00	6.00 - 16.00
WALL2	0.73 - 0.95	0.60 - 0.90	0.60 - 0.90	0.65 - 2.00
WALL3	0.17 - 0.25	0.20 - 0.31	0.25 - 0.45	0.25 - 0.72
NRPK1	1.25 - 1.40	0.65 - 1.33	0.65 - 1.40	0.65 - 2.80
NRPK2	0.15 - 0.27	0.21 - 0.27	0.27 - 0.40	0.25 - 0.40
YLPR1	2.60 - 5.25	2.60 - 5.00	2.30 - 3.25	1.70 - 8.00
YLPR2	0.96 - 2.00	0.82 - 1.92	0.77 - 2.19	1.25 - 2.83
YLPR3	0.45 - 0.60	0.46 - 0.60	0.42 - 0.65	0.40 - 1.31
CISC1	1.89 - 2.30	1.40 - 2.40	1.60 - 2.75	1.60 - 3.35
CISC2	0.53 - 0.60	0.50 - 0.65	0.65 - 0.90	0.62 - 1.50
LKWH1	0.90 - 2.00	0.90 - 2.00	1.50 - 2.00	1.30 - 2.00
LKWH2	0.30 - 0.46	0.30 - 0.68	0.30 - 0.60	0.40 - 0.53
BURB1	0.65 - 1.00	0.83 - 0.94	0.8 - 1.50	0.75 - 1.75
BURB2	0.29 - 0.31	0.29 - 0.31	0.30 - 0.40	0.26 - 0.43
Suckers	0.30 - 0.38	0.30 - 0.41	0.30 - 0.41	0.30 - 0.85
Stickle.	2.75 - 3.00	2.75 - 3.00	3.00 - 3.20	1.90 - 3.15
Small Fishes	1.71	1.71 - 2.00	1.85 - 2.00	1.60 - 2.50
DCCO	0.52	0.45 - 0.56	0.52	0.52
AWPE	0.2	0.19 - 0.20	0.19 - 0.20	0.19 - 0.20

Pisc. Birds	0.25	0.25	0.25	0.25
Non-Pisc. Birds	0.25	0.25	0.25	0.25
Chiro. & Dip.	13.1	13.1	13.1	13.10 - 18.00
Amphi.	5.7	5.70 - 6.60	5.70 - 6.60	5.70 - 8.76
Molluscs & Gastro.	3.8	3.00 - 3.80	3.00 - 3.80	3.00 - 6.11
Other Inverts	5.35	4.63 - 5.35	4.63 - 5.35	4.63 - 7.35
Litt. Zoopl.	35	35.00 - 37.00	35	35.00
Pel. Zoopl.	35	32.00 - 44.00	32.00 - 40.00	32.00
Cyanobacteria	131.5	131.5	131.5 - 200.0	131.5 - 200.0
Phytoplankton	131.5	131.5 - 176.0	176.0 - 200.0	131.5 - 200.0
Macrophytes	8.80 - 20.0	8.80 - 20.00	8.80 - 20.00	8.80 - 20.00

Table A1.4. Range of consumption/biomass (year⁻¹) values used in the balanced Ecopath models for each of the four modeled eras (1800, 1900, 1965, 2005).

Functional Group	Consumption/Biomass (/year)			
	1800	1900	1965	2005
WALL1 stocked			49.45	45.34
WALL2 stocked			4.26	6.39
WALL3 stocked			1.85	1.85
WALL1	73.43 - 88.20	48.16 - 87.98	45.03 - 70.14	103.38
WALL2	5.40 - 6.57	4.26 - 6.54	3.35 - 4.26	11.38
WALL3	1.50 - 1.95	1.50 - 1.95	1.50 - 1.85	1.50 - 3.64
NRPK1	7.20 - 8.94	6.27 - 8.94	5.44 - 6.49	3.87 - 12.51
NRPK2	1.40 - 1.95	1.40 - 1.95	1.40 - 1.90	1.40 - 3.00
YLPR1	11.67 - 16.70	11.73 - 18.72	11.00 - 19.54	9.01 - 52.34
YLPR2	4.56 - 6.75	4.45 - 6.68	4.38 - 8.16	3.86 - 14.20
YLPR3	2.74 - 3.57	2.84 - 3.57	2.84 - 3.50	1.46 - 5.00
CISC1	11.15 - 12.97	10.44 - 14.41	10.19 - 11.97	9.25 - 18.79
CISC2	3.65 - 3.69	3.65 - 4.00	3.60 - 4.00	3.69 - 6.42
LKWH1	5.41 - 11.60	5.16 - 12.13	5.43 - 12.13	5.71 - 10.80
LKWH2	2.35 - 2.85	2.35 - 3.00	2.35 - 3.00	2.35 - 3.00
BURB1	4.24 - 6.34	4.02 - 6.14	4.02 - 6.30	3.65 - 11.27
BURB2	1.90 - 2.22	1.90 - 2.22	1.95 - 2.00	1.95 - 3.30
Suckers	2.25 - 2.26	2.25 - 3.80	2.26 - 3.80	2.26 - 3.80
Stickle.	9.53 - 11.28	9.53 - 14.00	10.50 - 14.0	6.30 - 14.00
Small Fishes	6.42 - 8.66	6.42 - 10.00	8.66 - 10.00	6.38 - 10.00
DCCO	72.9	72.9	72.9	72.9
AWPE	110	110	110	110

Pisc. Birds	58	58	58	58
Non-Pisc. Birds	58	58	58	58
Chiro. & Dip.	62.4	62.4	62.4	62.40 - 65.85
Amphi.	30.2	30.2	30.2	27.20 - 30.20
Molluscs & Gastro.	24.4	24.4	24.4	21.40 - 24.40
Other Inverts	31.8	31.8	31.8	24.00 - 31.80
Litt. Zoopl.	120	120	120	120
Pel. Zoopl.	120	120.00 - 150.00	120	113.00 - 176.00

Table A1.5. Range of ecotrophic efficiency values used in the balanced Ecopath models for each of the four modeled time periods (1800, 1900, 1965, 2005).

Functional Group	Ecotrophic Efficiency			
	1800	1900	1965	2005
WALL1 stocked			0.98-0.99	0.98
WALL2 stocked			0.36-0.68	0.94
WALL3 stocked			1	0.67
WALL1	0.91-1.00	0.48-0.99	0.56-0.99	0.00-0.98
WALL2	0.32-0.96	0.37-0.99	0.50-0.99	0.18-1.00
WALL3	0.01-0.12	0.06-0.93	0.35-0.99	0.08-0.90
NRPK1	0.56-1.00	0.55-0.95	0.22-0.68	0.74-0.99
NRPK2	0.02-0.28	0.16-0.99	0.08-0.89	0.10-0.18
YLPR1	0.90-1.00	0.85-1.00	0.21-0.98	0.09-0.92
YLPR2	0.57-0.98	0.62-0.99	0.04-0.53	0.05-1.00
YLPR3	0.47-0.90	0.45-0.91	0.31-0.98	0.06-0.98
CISC1	0.95-1.00	0.57-0.99	0.20-0.55	0.14-0.99
CISC2	0.90-0.96	0.60-1.00	0.92-0.98	0.23-0.99
LKWH1	0.63-0.99	0.35-1.00	0.21-0.93	0.21-0.97
LKWH2	0.17-0.83	0.59-0.99	0.22-0.96	0.68-0.95
BURB1	0.68-0.99	0.54-0.94	0.24-0.99	0.47-0.98
BURB2	0.01-0.76	0.02-0.37	0.38-0.93	0.44-0.78
Suckers	0.46-0.69	0.42-1.00	0.12-0.59	0.22-0.99
Stickle.	0.97-0.99	0.84-0.99	0.69-0.99	0.64-0.99
Small Fishes	0.95	0.55-0.99	0.71-0.97	0.69-0.97
DCCO	0.00-0.09	0.00-0.10	0.00-0.34	0.00-0.01
AWPE	0.00	0.00	0.00	0.00

Pisc. Birds	0.00	0.00	0.00	0.00
Non-Pisc. Birds	0.00	0.00	0.00	0.00-0.58
Chiro. & Dip.	0.16-0.80	0.14-0.91	0.20-0.50	0.09-0.95
Amphi.	0.68-0.95	0.70-0.98	0.63-0.83	0.60-0.95
Molluscs & Gastro.	0.35-0.90	0.17-0.97	0.09-0.70	0.08-0.95
Other Inverts	0.49-0.95	0.61-0.96	0.60-0.80	0.60-0.99
Litt. Zoopl.	0.90-0.95	0.88-0.95	0.91-0.95	0.34-0.72
Pel. Zoopl.	0.72-0.99	0.86-1.00	0.32-0.94	0.40-0.99
Cyanobacteria	0.01-0.16	0.01-0.16	0.01-0.08	0.00-0.12
Phytoplankton	0.24-0.95	0.23-1.00	0.36-0.93	0.16-0.96
Macrophytes	0.10-0.13	0.10-0.13	0.10-0.13	0.10-0.21
Detritus	0.24-0.83	0.23-0.82	0.25-0.73	0.11-0.75

Table A1.6. Range in multistanza ages (months) and von Bertalanffy K (/year) values used to describe the dynamics of the multistanza groups in the balanced Ecopath models for each of the four modeled eras (1800, 1900, 1965, 2005). The multistanza age represents the number of months of age at which fish in one functional group transition to the next older group. For example, WALL1 individuals transition to WALL2 at 3 months old.

Functiona l Group	1800	1900	1965	2005
Multistanza Age (Months)				
WALL1	0	0	0	0
WALL2	3	3	2-3	3-4
WALL3	39-40	39-40	36-39	36-42
NRPK1	0	0	0	0
NRPK2	16-26	16-26	22-24	15-24
YLPR1	0	0	0	0
YLPR2	15-18	14-18	14-18	8-23
YLPR3	33-52	33-52	48-52	30-75
CISC1	0	0	0	0
CISC2	18-20	16-20	16-20	18-24
LKWH1	0	0	0	0
LKWH2	26-34	22-34	26-30	26-30
BURB1	0	0	0	0
BURB2	42-48	37-48	37-48	42-48
von Bertalanffy K (/year)				
WALL	0.1	0.10-0.21	0.150-0.206	0.10-0.22
NRPK	0.109-0.270	0.101-0.270	0.101-0.200	0.101-0.270
YLPR	0.201-0.307	0.20-0.36	0.201-0.307	0.070-0.307
CISC	0.20-0.27	0.2-0.3	0.26-0.35	0.27-0.36

LKWH	0.149-0.283	0.156-0.300	0.156-0.283	0.145-0.283
BURB	0.115-0.200	0.115-0.33	0.115-0.327	0.115-0.3

Table A1.7. Range in fishery catches ($t \cdot km^{-2} \cdot yr^{-1}$) used in the balanced Ecopath models for each of the four modeled eras (1800, 1900, 1965, 2005).

Functional Group	Fisheries Catches ($\times 10^{-2}$) ($t \cdot km^{-2} \cdot yr^{-1}$)			
	1800	1900	1965	2005
WALL3	0.86 - 5.90	5.56 - 16.99	0.045 - 5.56	0.0013 - 0.43
NRPK2	1.42 - 38.00	12.00 - 32.50	5.75 - 30.31	4.58 - 5.54
YLPR3	0.40 - 0.73	0.67 - 1.10	0.67 - 134.47	0.15 - 1.60
CISC2	0.25 - 0.40	0.27 - 1.60	0.51 - 300.00	0.21 - 12.72
LKWH2	14.20 - 163.80	73.37 - 165.00	40.00 - 183.50	23.29 - 28.03
BURB2	0.50 - 4.88	2.01 - 5.42	2.010 - 26.68	0.048 - 4.50
Suckers	1.37 - 7.00	2.60 - 28.50	2.26 - 11.85	0.36 - 3.74
DCCO	<<0.1 - 0.1	0.010 - 0.37	<<0.10 - 0.10	0.010 - 0.10