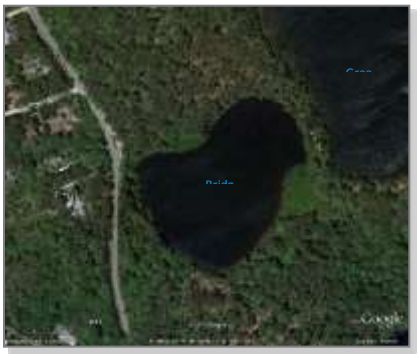
Bridge Pond, Eastham MA



Setting

Pond Size: 6.7 acres; Maximum Depth: 20 ft.

Watershed Size: 7.9 acres

Public Access: Herring Brook Road to walking trails in conservation area and Wiley Park.

Uses: Wildlife viewing; herring run; fishing. No boat launches or developed beaches.

Fish community: warm water

Data: PALS, Eichner (2009), EcoLogic 2011

Current Conditions

- Stable water quality conditions, 2003-2017
- Hydrologically connected to Great Pond (inflow) and Herring Brook (outflow).
- Estimated 10.6 – 14.7 kg of annual phosphorus loading from Great Pond.
- Land use is park/conservation land around the pond, except for Herring Brook Road. No residences within 100 m of pond.
- Deep waters have low DO (transient)
- Possible sediment release of phosphorus
- Most likely phosphorus sources: birds, precipitation, roads, Great Pond

Outlook for Future

- Watershed likely to remain undeveloped

Recommended Actions

Watershed Best Management Practices

- Manage Great Pond phosphorus concentrations
- Maintain vegetated shoreline.
- Discourage large flocks of birds
- Control road runoff

Bridge Pond Water Quality Summary

Water Column	Parameter	Result[1]	"Healthy" Ponds Thresholds[2]
Upper Waters	Total Phosphorus	15.6 µg /l	≤10 µg/l
	Chlorophyll-a	7 µg /l	≤1.7 µg/l
	Secchi Disk Transparency	2.5 m	Not calculated
Lower Waters	Total Phosphorus *(maximum average)*	55.9 µg /l	--
	Dissolved Oxygen *(minimum average)*	3.4 mg/l	--

[1]Annual average results- PALS- Total phosphorus, chlorophyll-a, Secchi disk transparency, and dissolved oxygen, 2012-2017.
[2]Cape Cod Commission 2003, Table 5.

Updated December 2018

Depot Pond, Eastham MA

Setting

Pond Size: 27.9 acres; Maximum Depth: 33 ft

Watershed Size: 64.9 acres

Public Access: Unmarked fire road

Uses: Swimming, fishing, non-motorized boating

Fish community: cold water

Data: PALS, Eichner 2009, EcoLogic 2011

Current Conditions

- Seasonal oxygen depletion in deep waters
- Increasing phosphorus and chlorophyll-a, declining water quality 2003-2017
- Major phosphorus sources: Septic (0-44%), birds (31-38%), roads (7-25%), roofs (7-25%)
- 6 residences within 300 ft. upgradient

Outlook for Future

- Septic system contribution may increase as discharges slowly reach the pond
- Internal sediment phosphorus loading will continue to increase

Recommended Actions

In-pond measures:

- Alum treatment program, aeration

Watershed Best Management Practices (BMPs):

- Septic system maintenance

Depot Pond Water Quality Summary

Water Column	Parameter	Result[1]	"Healthy" Ponds Thresholds[2]
Upper Waters	Total Phosphorus	11.3 µg /l	≤10 µg/l
	Chlorophyll-a	3.7 µg /l	≤1.7 µg/l
	Secchi Disk Transparency	2.9 m	Not calculated
Lower Waters	Total Phosphorus *(maximum average)*	29.1 µg /l	--
	Dissolved Oxygen *(minimum average)*	0.7 mg/l	--

[1]Annual average results – PALS- Total phosphorus, chlorophyll-a, Secchi disk transparency, and dissolved oxygen, 2012-2017.
[2]Cape Cod Commission 2003, Table 5.

Updated December 2018

Great Pond, Eastham MA

Setting

Pond Size: 109.7 acres; Maximum Depth: 36 ft.

Watershed Size: 226 acres

Public Access: Town Beach, Wiley Park, and Nickerson Conservation Area

Uses: Swimming, fishing, non-motorized boating (motorized boating by permit)

Fish community: cold water

Data: PALS, Eichner 2009, EcoLogic 2011, pre and post alum treatment monitoring

Current Conditions

- Stable water quality conditions, 2003-2017
- Low dissolved oxygen levels in deep water during summer
- Major phosphorus sources: Sediment (33-34%), precipitation (15-28%), septic (11-17%)
- 22 properties within 300 ft. upgradient
- Discharges to Bridge Pond; herring run from Herring Brook through Bridge Pond.

Outlook for Future

- Septic system contribution will increase as discharges slowly reach the pond (time of travel estimated 35-81 years)
- Alum treatment has reduced sediment phosphorus release

Recommended Actions

In-pond measure:

- Monitor effectiveness of 2013 alum treatment program

Watershed Best Management Practices:

- Septic system maintenance/upgrades
- Replace septic systems with sewers
- Maintain shoreline vegetative buffers

Great Pond Water Quality Summary

Water Column	Parameter	Result[1]	"Healthy" Ponds Thresholds[2]
Upper Waters	Total Phosphorus	14.6 µg /l	≤10 µg/l
	Chlorophyll-a	4.2 µg /l	≤1.7 µg/l
	Secchi Disk Transparency	2.4 m	Not calculated
Lower Waters	Total Phosphorus *(maximum average)*	29.3 µg /l	--
	Dissolved Oxygen *(minimum average)*	0.2 mg/l	--

[1]Annual average results – PALS- Total phosphorus, chlorophyll-a, Secchi disk transparency and dissolved oxygen, 2014-2017 (post alum treatment)

[2]Cape Cod Commission 2003, Table 5.

Updated December 2018

Herring Pond, Eastham MA

Setting

Pond Size: 44.2 acres; Maximum Depth: 35 ft.

Watershed Size: 79.8 acres

Public Access: Town Beach

Uses: Swimming, fishing, boating

Fish community: cold water

Data: PALS, Eichner 2009, EcoLogic 2011, pre and post alum treatment monitoring

Current Conditions

- Positive response to 2012 alum treatment
- Dissolved oxygen depletion in deep waters
- Major phosphorus sources: Sediment (0-60%) has been remediated, roads (6-35%), precipitation (6-31%), roof (3-18%), septic (0-16%)
- 20 leach fields within 300 ft. (upgradient)

Outlook for Future

- Septic system contribution will increase as discharges slowly reach the pond (time of travel estimated 35-81 years)

Recommended Actions

In-pond treatment:

- Continue to track effectiveness of 2012 alum treatment program

Watershed Best Management Practices (BMPs):

- Septic system maintenance
- Residential and lawn practices

Herring Pond Water Quality Summary

Water Column	Parameter	Result[1]	"Healthy" Ponds Thresholds[2]
Upper Waters	Total Phosphorus	12.2 µg /l	≤10 µg/l
	Chlorophyll-a	2 µg /l	≤1.7 µg/l
	Secchi Disk Transparency	4.4 m	Not calculated
Lower Waters	Total Phosphorus *(maximum average)*	20.1 µg /l	--
	Dissolved Oxygen *(minimum average)*	1.5 mg/l	--

[1]Annual average results – PALS-Total phosphorus, chlorophyll-a, Secchi disk transparency, and dissolved oxygen 2013-2017 (post treatment); [2]Cape Cod Commission 2003, Table 5.

Updated December 2018

Jemima Pond, Eastham MA

Setting

Pond Size: 6.4 acres; Maximum Depth: 15 ft.

Watershed Size: 17.9 acres

Public Access: Samoset Road bathing beach

Uses: Swimming, fishing, non-motorized boating

Fish community: warm water

Data: PALS, Eichner 2009, EcoLogic 2011

Current Conditions

- Stable water quality conditions, 2003-2017
- Well-mixed water column, no evidence of dissolved oxygen depletion
- Six residences within 300 ft. upgradient
- Most likely phosphorus sources: birds, septic, precipitation, road runoff

Outlook for Future

- Phosphorus concentrations in pond may increase as discharges from septic systems reach the pond (time of travel in groundwater estimated 35-81 years)
- Phosphorus concentrations in pond may increase if road runoff is not controlled.

Recommended Actions

Watershed Best Management Practices (BMPs):

- Maintain or upgrade septic systems
- Maintain vegetated shoreline
- Discourage large flocks of birds
- Control road runoff

Jemima Pond Water Quality Summary

Water Column	Parameter	Result[1]	"Healthy" Ponds Thresholds[2]
Upper Waters	Total Phosphorus	21.5 µg /l	≤10 µg/l
	Chlorophyll-a	2.8 µg /l	≤1.7 µg/l
	Secchi Disk Transparency	2.6 m	Not calculated

[1]Annual average results- PALS- Total phosphorus, chlorophyll-a, and Secchi disk transparency 2012-2017
[2]Cape Cod Commission 2003, Table 5.

Updated December 2018

Little Depot Pond, Eastham MA

Setting

Pond Size: 2.3 acres; Maximum Depth: 10 ft.

Watershed Size: 2.3 acres

Public Access: Samoset Road or Rail Trail.

Uses: Wildlife observation, aesthetics, swimming, fishing, non-motorized boating

Fish community: warm water

Data sources: PALS, EcoLogic 2011

Current Conditions

- Impacted by human activities
- Water column well-mixed
- Three residences within 300 ft. upgradient
- Most likely phosphorus sources: birds, septic, precipitation, road runoff (Samoset)
- Stable water quality conditions, 2003-2017

Outlook for Future

- Phosphorus concentrations in pond may increase as discharges from septic systems slowly reach the pond (time of travel in groundwater estimated 35-81 years)
- Phosphorus concentrations in pond may increase if road runoff is not controlled.

Recommended Actions

Watershed Best Management Practices:

- Maintain/upgrade septic systems
- Retain vegetated shoreline
- Discourage large flocks of birds
- Reduce road runoff

Little Depot Pond Water Quality Summary

Water Column	Parameter	Result[1]	"Healthy" Ponds Thresholds[2]
Upper Waters	Total Phosphorus	62.2 µg /l	≤10 µg/l
	Chlorophyll-a	11.1 µg /l	≤1.7 µg/l
	Secchi Disk Transparency	1.1 m	Not calculated
Lower Waters	Total Phosphorus *(maximum average)*	Not sampled	--
	Dissolved Oxygen *(minimum average)*	8.9 mg/l	--

[1]Annual average results-PALS- Total phosphorus, Secchi disk transparency, dissolved oxygen, and chlorophyll-a, 2012-2017
[2]Cape Cod Commission 2003, Table 5.

Updated December 2018

Minister Pond, Eastham MA

Setting

Pond Size: 16.8 acres; Maximum Depth: 13 ft.

Watershed Size: 151 acres

Public Access: "Fisherman's Launch" at Schoolhouse Pond

Uses: Swimming, fishing, non-motorized boating

Fish community: warm water

Data: PALS, Eichner 2009, EcoLogic 2011

Current Conditions

- Dissolved oxygen depletion in lower waters
- Major phosphorus sources: Roads (29-60%), septic (0-45%); sediment not quantified
- 16 residences within 300 ft. upgradient, 2 developable parcels
- Hydrologically connected to Schoolhouse

Outlook for Future

- Internal (sediment) phosphorus loading will continue to adversely affect water quality unless addressed
- Septic system contribution will increase as discharges slowly reach the pond (time of travel estimated 35-81 years)
- Water quality conditions are relatively stable 2003-2017

Recommended Actions

In-Lake Measures

- Aeration or alum treatment

Watershed Best Management Practices (BMPs):

- Septic system maintenance
- Maintain vegetated shoreline
- Mitigate roadway runoff

Minister Pond Water Quality Summary

Water Column	Parameter	Result[1]	"Healthy" Ponds Thresholds[2]
Upper Waters	Total Phosphorus	26.1 µg /l	≤10 µg/l
	Chlorophyll-a	6.3 µg /l	≤1.7 µg/l
	Secchi Disk Transparency	1.6 m	Not calculated
Lower Waters	Total Phosphorus *(maximum average)*	64.5 µg /l	--
	Dissolved Oxygen *(minimum average)*	2 mg/l	--

[1]Annual average results-PALS- Total phosphorus, chlorophyll-a, Secchi disk transparency and dissolved oxygen 2012-2017
[2]Cape Cod Commission 2003, Table 5.

Updated December 2018

Molls Pond, Eastham MA

Setting

Pond Size: 3.4 acres; Maximum Depth: 12 ft.

Watershed Size: 8.1 acres

Public Access: None

Uses: Swimming, fishing, non-motorized boating

Fish community: warm water

Data: PALS, Eichner 2009, EcoLogic 2011

Current Conditions

- Slight decline in water quality, 2003-2017
- Occasional occurrence of low oxygen conditions in deeper waters
- Most likely phosphorus sources: birds, septic, precipitation, road runoff
- Approximately 18 residences within 300 ft. upgradient

Outlook for Future

- Septic system contribution will increase as discharges slowly reach the pond (time of travel estimated 35-81 years)

Recommended Actions

Watershed Best Management Practices (BMPs):

- Maintain or upgrade septic systems
- Maintain vegetated shoreline
- Discourage large flocks of birds
- Control road runoff

Molls Pond Water Quality Summary

Water Column	Parameter	Result[1]	"Healthy" Ponds Thresholds[2]
Upper Waters	Total Phosphorus	23 µg /l	≤10 µg/l
	Chlorophyll-a	9.5 µg /l	≤1.7 µg/l
	Secchi Disk Transparency	2.2 m	Not calculated
Lower Waters	Total Phosphorus *(maximum average)*	24.7 µg /l	--
	Dissolved Oxygen *(minimum average)*	4.7 mg/l	--

[1]Annual average results-PALS- Total phosphorus, Secchi disk transparency, dissolved oxygen, and chlorophyll-a, 2012-2017.
[2]Cape Cod Commission 2003, Table 5.

Updated December 2018

Muddy Pond, Eastham MA

Setting

Pond Size: 10.5 acres; Maximum Depth: 5 ft.

Watershed Size: 39.9 acres

Public Access: None; private beach

Uses: Swimming, fishing, non-motorized boating

Fish community: warm water

Data: PALS, Eichner 2009, EcoLogic 2011

Current Conditions

- Impacted by human activities
- Dense aquatic plant growth
- Primary phosphorus sources: Roads (21-45%), septic (0-38%), birds (17-21%), precipitation (10-21%)
- 5 residences within 300 ft. upgradient

Outlook for Future

- Trend toward declining water quality conditions, 2003-2017
- Septic system contribution will increase as discharges slowly reach the pond (time of travel estimated 35-81 years)

Recommended Actions

In-pond measures:

- Aquatic plant management

Watershed Best Management Practices (BMPs):

- Septic system maintenance
- Shoreline protective measures

Muddy Pond Water Quality Summary

Water Column	Parameter	Result[1]	"Healthy" Ponds Thresholds[2]
Upper Waters	Total Phosphorus	35.2 µg /l	≤10 µg/l
	Chlorophyll-a	6.9 µg /l	≤1.7 µg/l
	Secchi Disk Transparency	1.2 m	Not calculated

[1]Annual average results-PALS- Total phosphorus, chlorophyll-a, Secchi disk transparency, and dissolved oxygen, 2012-2017.
[2]Cape Cod Commission 2003.

Updated December 2018

Schoolhouse Pond, Eastham MA

Setting

Pond Size: 6.8 acres; Maximum Depth: 13 ft.

Watershed Size: 5.7 acres

Public Access: Launch off Schoolhouse Road.

Uses: Swimming, fishing non-motorized boating

Fish community: warm water

Data: PALS, Eichner 2009, EcoLogic 2011

Current Conditions

- Hydrologically connected to Ministers Pond
- Water quality conditions stable, 2003-2017
- Primary phosphorus sources: Birds (26-46%), roads (18-26%), precipitation (14-21%); input from Minister Pond

Outlook for Future

- Transient stratification and low oxygen conditions will continue to allow sediment phosphorus release unless remediated

Recommended Actions

In-lake Measures

- Aeration
- Possible alum application

Watershed Best Management Practices (BMPs):

- Septic system maintenance

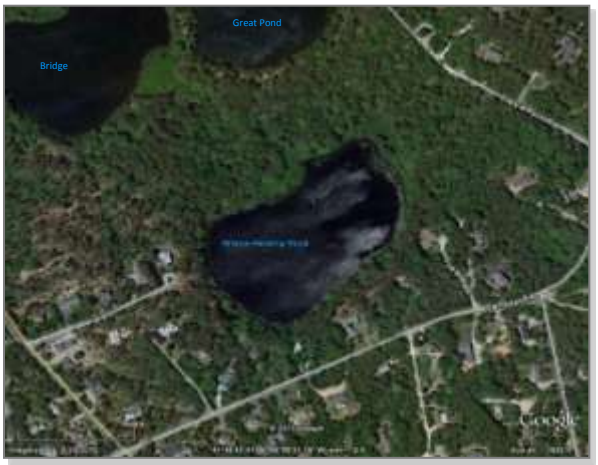
Schoolhouse Pond Water Quality Summary

Water Column	Parameter	Result[1]	"Healthy" Ponds Thresholds[2]
Upper Waters	Total Phosphorus	24.8 µg /l	≤10 µg/l
	Chlorophyll-a	6.9 µg /l	≤1.7 µg/l
	Secchi Disk Transparency	1.4 m	Not calculated
Lower Waters	Total Phosphorus *(maximum average)*	87.2 µg /l	--
	Dissolved Oxygen *(minimum average)*	0.9 mg/l	--

[1]Annual average results-PALS- Total phosphorus, chlorophyll-a, Secchi disk transparency, and dissolved oxygen, 2012-2017.
[2]Cape Cod Commission 2003, Table 5.

Updated December 2018

Widow Harding Pond, Eastham MA



Setting

Pond Size: 8.7 acres; Maximum Depth: 13 ft.

Watershed Size: 25.9 acres

Public Access: Walking trails in conservation area and Wiley Park

Uses: Wildlife viewing, swimming, fishing, non-motorized boating

Fish community: warm water

Data: PALS, Eichner 2009, EcoLogic 2011

Current Conditions

- Impacted by human activities
- Transient stratification and seasonal low dissolved oxygen
- 11 residences within 300 ft. upgradient
- Most likely phosphorus sources: birds, septic, precipitation, and road runoff.

Outlook for Future

- Stable water quality conditions, 2003-2017
- Septic system contribution will increase as discharges slowly reach the pond (time of travel estimated 35-81 years)

Recommended Actions

Watershed Best Management Practices (BMPs):

- Maintain or upgrade septic systems
- Maintain vegetated shoreline, minimize open lawn areas leading to water's edge
- Discourage large flocks of birds
- Control road runoff

Widow Harding Pond Water Quality Summary

Water Column	Parameter	Result[1]	"Healthy" Ponds Thresholds[2]
Upper Waters	Total Phosphorus	22.8 µg /l	≤10 µg/l
	Chlorophyll-a	4.0 µg /l	≤1.7 µg/l
	Secchi Disk Transparency	2.0 m	Not calculated
Lower Waters	Total Phosphorus	25.0 µg /l	--
	Dissolved Oxygen *(minimum)*	4.9 mg/l	--

[1]Annual PALS results (September sampling events), average 2012-2017
[2]Cape Cod Commission 2003, Table 5.

Updated December 2018