



BIG SHELL LAKE CAPACITY STUDY

FINAL REPORT - OCTOBER 2023



PREPARED FOR:

Resort Village of Big Shell

Resort Village of Echo Bay

Rural Municipality of Spiritwood No. 496

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1.0 INTRODUCTION

Big Shell Lake is situated within Treaty 6 lands, the traditional and ancestral territory of the Cree, Dene, Blackfoot, Sauteaux and Nakota Sioux, and home to the Métis. Big Shell Lake is surrounded by the Resort Village (RV) of Big Shell, the Resort Village (RV) of Echo Bay, and the Rural Municipality (RM) of Spiritwood. Big Shell Lake is located approximately 135 km northwest from Saskatoon, 65 km east of Shellbrook, and 48 km southeast from Spiritwood (**Figure 1**).

Big Shell Lake was largely undeveloped until the 1970s. In the early 1970s, properties began to develop into what is now known as the RV of Big Shell. In 1977, a private leasehold cottage development was subdivided to form the RV of Echo Bay. Over time, lakeshore developments within the RM of Spiritwood have grown to include Aspen Ridge Estates, Misty Grove, Sunset Rim Estates, and Solitude Ridge Campground. Also, the neighbouring RM of Meeting Lake has grown to include Boondocks Campground, which is within close proximity to Big Shell Lake. Big Shell Campground falls under the jurisdiction of the Province of Saskatchewan. These developments have brought significant increase in year-round, day use, and seasonal usage of Big Shell Lake.

The RV of Big Shell, the RV of Echo Bay, and the RM of Spiritwood have come together to think critically about the current state of development and lake use and assess how it is affecting the ecological condition of the lake. As a result of this effort, these communities have agreed to pursue a lake capacity study and Urban Systems was retained to conduct the study and final report. Funding for the study was received through the Province of Saskatchewan's Targeted Sector Support (TSS) initiative. The TSS initiative directed around \$1.5 million of Municipal Revenue Sharing funds to spur inter-municipal cooperation between Saskatchewan municipalities, build capacity and promote good governance.

The results of this study will influence policy shifts to improve cooperation between the local authorities and lead to more consistent development decisions that place consideration toward the preservation and management of the environment.

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 U:\Projects_Sask\Creation\10210_Design\Civil\Project\shlha_Project\SASL_0001_02 - Big Shell Lake - Environmental - 20230707.aprx\Big Shell Lake - Fig 1 - Project Location - 20230707.aprx



Big Shell Lake Capacity Study Project Location

Legend
 ★ Project Location



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FIGURE 1

Figure 1: Project Location

2.0 SCOPE OF WORK

2.1 OBJECTIVES

Big Shell Lake has faced a variety of environmental and development pressures over the years. Understanding that more information is needed to understand the ecological condition of the lake, communities surrounding Big Shell Lake have partnered to undertake this Lake Capacity Study. This partnership includes the following communities, which encompass the study area:

- The RV of Big Shell.
- The RV of Echo Bay.
- The RM of Spiritwood.

This partnership centered around a Project Charter formalizing an Intermunicipal Steering Committee (ISC) comprised of representation from each community. Through a request for proposals process, the ISC retained Urban Systems to measure key environmental and physical characteristics against historical information and data to determine:

- How the current level of development affects the lake.
- How to manage land use and development while protecting and preserving the natural and recreational attributes that the lake provides.

The main objective of this study was to assess the current ecological health, carrying capacity and current development and development pressures of the lake and surrounding areas. To achieve a balance between the preservation of the natural environment and economic development, the report provides recommendations that will guide decision-making on proposed future developments and redevelopments.

2.2 PROJECT PHASES

PHASE 1 – Taking Stock

The first phase of the project included taking stock of existing information to identify available data and evaluate any gaps. This included a project kick-off meeting followed by a collection and review of environmental information, infrastructure, and land use analysis.

In summer of 2022, the kick-off meeting between Urban Systems and the ISC was held. The intent of this meeting was to develop a project schedule, prepare a public engagement plan, and to take a land use inventory. The Urban Systems team requested information regarding habitat conditions, existing water quality data, details on local wastewater, solid waste management, roads, stormwater management and other infrastructure service data. This information was provided by the ISC and discussed via individual stakeholder meetings.

As part of Phase 1, regional information was collected on historical, meteorological, and hydrological data. Urban Systems analyzed local watershed boundaries and potential wetland areas to support assessment of contributing vs. non-contributing watershed catchment areas. In addition, the land use analysis was conducted using aerial imagery and mapping to estimate qualitative habitat cover types and land use currently present within the study area.

PHASE 2 – Field Study

To build on information collected through Phase 1, field surveys were undertaken including water quality sampling and habitat assessments.

Water Quality Sampling Method

The water quality sampling for Big Shell Lake included four separate sampling locations. Each sampling location was accessed via boat using a GPS unit. Areas with relatively deep water were selected for dissolved oxygen/temperature profiles. Samples for laboratory analysis were collected at depth using a Van Dorn sampler. Dissolved oxygen and water temperature were measured using a YSI multi-probe.

Habitat Assessment Method

The field habitat assessment was conducted by Urban Systems on August 5th, 2022. Riparian habitats were assessed from boat and shore (via existing roads). A boat was used to cruise the shoreline areas and create a map of riparian and aquatic habitats.

Boat Capacity

A boat count was completed July 1st, 2023. This date was selected to ensure data was collected when the lake is typically at peak usage by boats. During the early morning data collection period, Urban Systems utilized a 360 camera to capture footage from a boat of all boats parked at docks or on the shoreline. A count was also conducted of boats visibly parked on private properties and in public storage areas. In the afternoon, the 360 camera again captured footage of all docked/shoreline boats, as well as active boats on the lake.

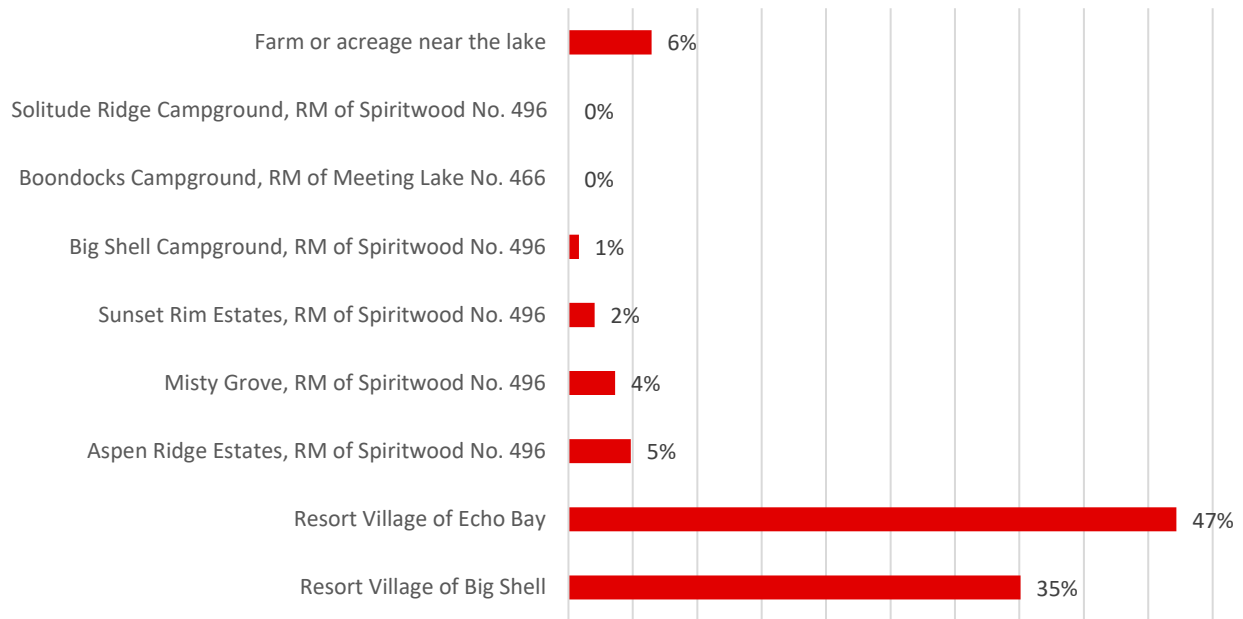
PHASE 3 – Public Engagement

Phase 3 focused on public engagement, which included an email/online survey and an in-person engagement as ways to gather information from lake users.

Survey

Urban Systems created and distributed a public survey to all residents within the RV of Big Shell, the RV of Echo Bay, and the RM of Spiritwood. The purpose of the public survey was to collect information and feedback from those who access Big Shell Lake. The survey was released in the beginning of August 2022 and shared with respondents via email and social media. The survey remained open throughout the month and closed on August 31, 2022. In this time, 249 lake users responded to the survey. Of this number, 35% had properties located within the RV of Big Shell, 47% had properties within the RV of Echo Bay, and the remaining 18% had properties throughout the RM of Spiritwood (**Figure 2**). Results from the public survey revealed important information on lake usage, existing land uses, and environmental concerns.

Figure 2: Survey Respondent Property Locations



In-Person Engagement

Urban Systems visited Big Shell Lake on Saturday August 6, 2022, for a summer engagement session. The purpose of the visit was to share information about the project, collect feedback, and promote the public survey. Urban Systems set up a tent with poster boards to display project background and survey information. The morning was spent near the four-way stop in the RV of Echo Bay and the afternoon was spent at the main beach within the RV of Big Shell.

Feedback collected from the survey and public engagement day is included throughout this report. Full survey responses are included in Appendix A.

PHASE 4 – Recommendations and Guidelines

In Phase 4, the information and public input gathered through the previous project phases was summarized to inform this report. Throughout this phase, our team worked to develop lake management recommendations, development guidelines, and this final Lake Capacity Study Report.

3.0 ENVIRONMENTAL REVIEW

Information was collected from a wide range of databases, online resources and previous studies to gain information about current and historical conditions and events on Big Shell Lake and its surrounding uplands.

3.1 TOPOGRAPHY

Big Shell Lake is located in the Boreal Transition ecoregion (Boreal Plain ecozone) of Saskatchewan. This ecoregion is characterized by an intermingling of forested areas and agricultural land uses at the northern limit of arable lands (Ecological Framework of Canada, 2022). Much of the ecoregion is underlain by Cretaceous shale and covered by undulating to kettle, calcareous, glacial till with significant areas of level lacustrine deposits. The ecoregion is associated with morainal deposits, small lakes, ponds, and sloughs occupying shallow depressions (Ecological Framework of Canada, 2022). Slope ranges from moderate to gentle (10-2%) in the west and strong to moderate (15-5%) in the east (Canadian Soil Information Service, 2022).

3.2 CLIMATE

The Boreal Transition ecoregion has a typical climate of warm summers and cold winters, with a mean yearly temperature of 1°C. The mean summer temperature is 14°C and the mean winter temperature is -13.5°C (Ecological Framework of Canada, 2022). Climate data from the Medstead station, located 60 km northwest, showed July to be the warmest month with a daily maximum of 23°C, a daily average of 16.5°C, and January to be the coldest month with a daily minimum of -22.1°C, and a daily average of -16.9°C (Environment and Climate Change Canada, 2022). Mean annual precipitation ranges from 450 mm to 550 mm (Ecological Framework of Canada, 2022). July is the wettest month, receiving an average of 90 mm of precipitation with an annual average of 455 mm. Approximately 2/3 of the annual precipitation falls between May and September, with the remainder falling as snow (Environment and Climate Change Canada, 2022).

3.3 GEOLOGY AND SOILS

In Saskatchewan, soils are classified or named according to the Canadian System of Soil Classification. The Saskatchewan Soil Information System is based on information from the Canadian Soil Information Service (CanSIS). Soils surrounding Big Shell Lake are predominantly Orthic Dark Gray and Orthic Gray Luvisol soils formed on loamy glacial till (Canadian Soil Information Service, 2022).

CanSIS indicates surface expression surrounding the Lake is Hummocky, apart from the northeast corner where the surface expression is Undulating (Canadian Soil Information Service, 2022). Soils throughout are described to have moderately severe and/or severe limitations that restrict the range of crops and may require special conservation practices.

The geology of the Lake is classified as Mh (moraine hummocky). Mh is glacial deposits of till consisting of unsorted mixtures of boulders, gravel, sand, silt, and clay; deposited from glacial ice during periods of advance, retreat, and stagnation (Saskatchewan Energy and Mines, 2022).

Clubroot is a soil-borne disease that affects the productivity of certain crop types (Canola Council of Canada, 2022). In 2009, clubroot was declared a pest under the *Pest Control Act*. A review of the Government of Saskatchewan's *Clubroot Cumulative Survey Results (2021)* was conducted for the RM of Spiritwood. Results indicate that clubroot has been historically identified within > 10 fields in the rural municipality surrounding the Lake (SKCDC, 2022). No occurrences of clubroot have been recorded in the municipality directly south of the Lake (Leask No. 464).

3.4 WATERSHED AND TRIBUTARY ANALYSIS

Big Shell Lake is within the North Saskatchewan River Basin, approximately 7km southeast of the Churchill River Basin boundary. It is within the 05GF sub-sub basin as defined by the Agriculture and Agri-Food Canada Watersheds Project, which is approximately 520,000 ha. The lake and its associated catchment area are located on the southwestern edge of the sub-sub basin.

Urban Systems carried out a characterization of the Big Shell Lake watershed using readily available data sets. This includes a regional Digital Elevation Model (DEM), regional satellite imagery, available lake level data, and other watershed information (**Figure 3**). Utilizing the Canadian Digital Elevation Model (CDEM) dataset at a 25m x 25m cell resolution, we analyzed the catchments and sub-catchments that contribute to Big Shell Lake. This process leverages the elevation values assigned to each pixel (raster cell) in the DEM to create a flow direction dataset. This dataset indicates which direction surface water will flow, and is in turn used to create a flow accumulation layer. Knowing the flow direction and accumulation for every location in the study area, we delineated the major flow paths and sub-catchments that contribute to the lake. From this analysis, we calculated a total catchment area of 23,659 ha for the lake. Flow from the lake continues north towards Highway 3 (**Figure 4**).

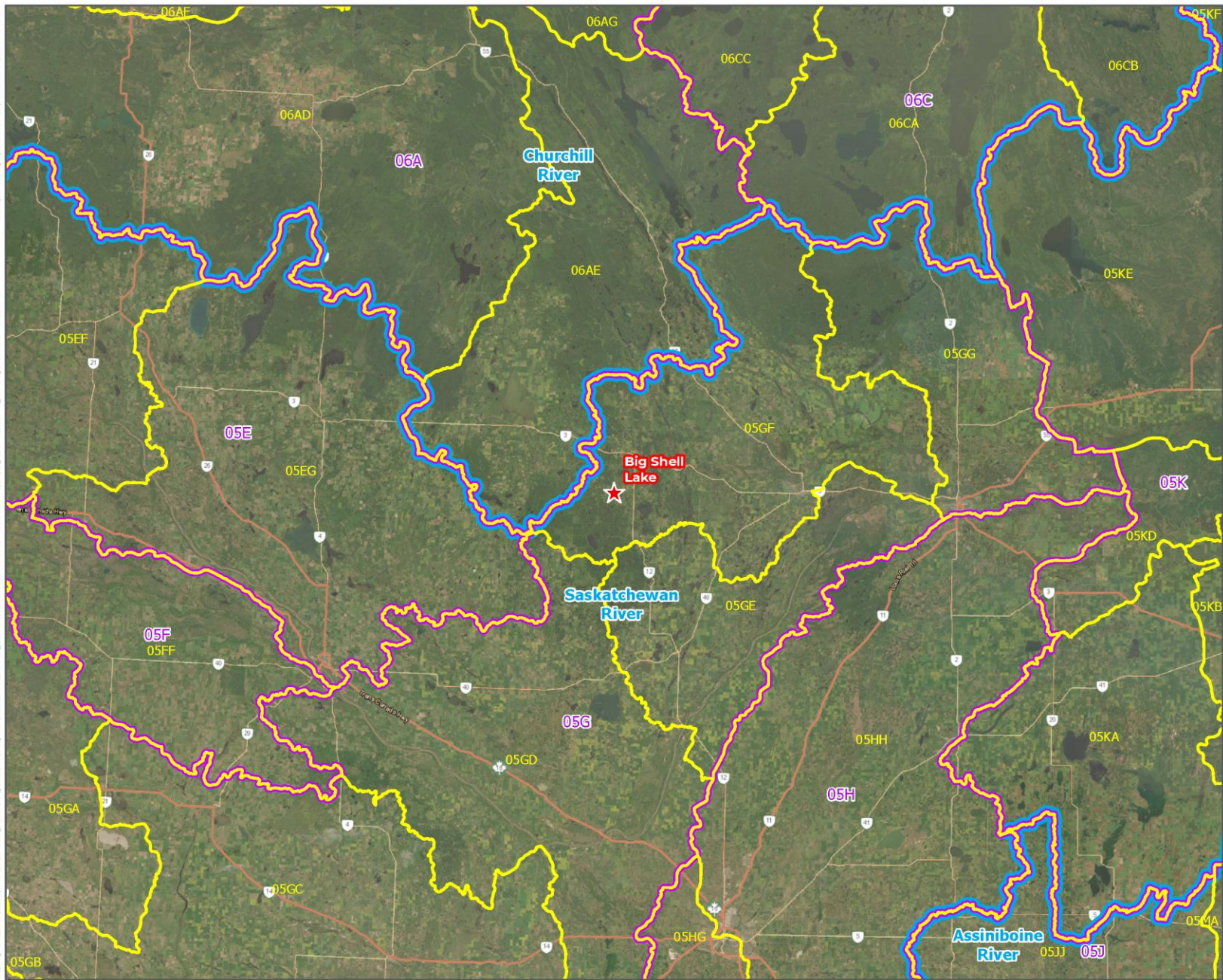
3.5 GROUNDWATER

A desktop review of groundwater information was conducted as no specific studies were carried out to test groundwater conditions.

Groundwater supply in the North Saskatchewan River basin, which includes Big Shell Lake, is contained in two aquifer types: buried preglacial valleys and inter-till aquifers. The entire basin is underlain by the Lea Park bedrock formation. The Lea Park is a marine shale that is not considered an aquifer. The Iffley Valley aquifer is a buried-valley aquifer and trends southeast, following the base of the Thickwood Hills. Buried-valley aquifers are closer to the surface than bedrock aquifers and tend to be of better quality. There are few wells in the Iffley Valley Aquifer due to the presence of surficial and inter-till aquifers, which are not as deep and generally provide better quality water.

Water in the aquifer is believed to have total dissolved solids in the 1,000 to 2,500 mg/L range with hardness ranging from 500 to over 1,500mg/L as CaCO₃. The Water Security Agency interactive map of groundwater wells shows approximately 75 wells within 3 km around Big Shell Lake (Government of Saskatchewan, 2020).

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 U:\Projects\6641\6641001\020 - Design\GIS\Projects\6641_02 - Big Shell Lake - Environmental - 2023\0707_020\Big Shell Lakes - Fig 3 - Major Basins - 2023\0707



Big Shell Lake Capacity Study

Major Basins

Legend

- ★ Project Location
- AAFC - Sub-Sub-Basin Boundary
- AAFC - Sub-Basin Boundary
- AAFC - Major Basin Boundary

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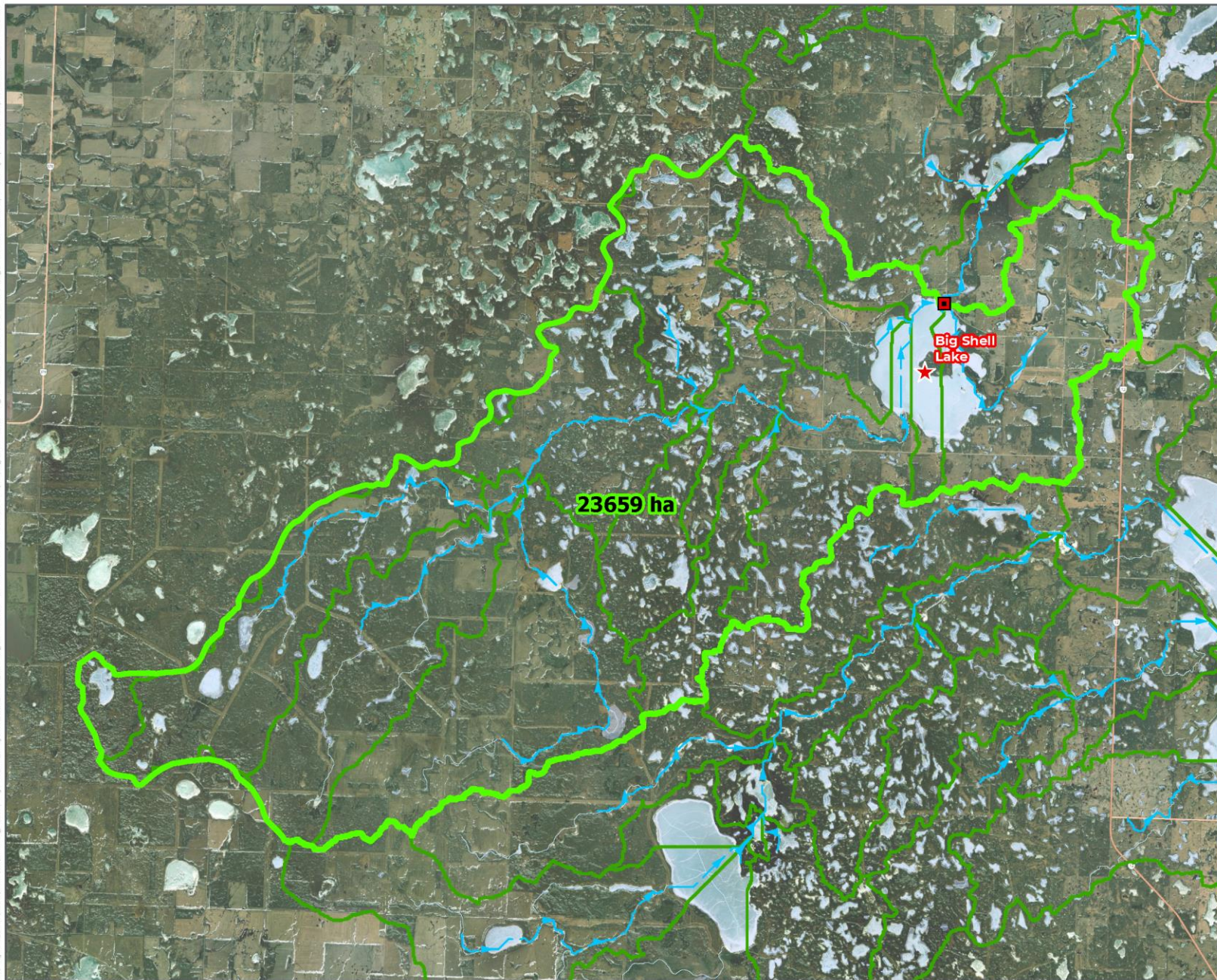
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FIGURE 3

Figure 3: Major Basins

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Big Shell Lake Capacity Study Lake Watershed and Drainage

Legend

- Watershed - Water Flow Exit Point
- Major Flow Paths
- Watercourses
- Watershed - Big Shell Lake
- Sub-Watersheds
- Waterbodies

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FIGURE 4

Figure 4: Lake Watershed and Drainage

3.6 VEGETATION

The Boreal Plains ecozone is characterized by a blend of agricultural lands and forests. Native upland forests are typically trembling aspen (*Populus tremuloides*) with shrub and forb understories. Balsam poplar (*Populus balsamifera*), black spruce (*Picea mariana*) willows (*Salix* spp.), and sedges (*Carex* spp.) are mainly located near wetter areas (Ecological Framework of Canada, 2022).

Desktop search results from HABISask indicate no rare plant species within the vicinity of Big Shell Lake (SKCDC, 2022).

The site visit conducted by Urban Systems on August 4th and 5th, 2022 confirmed that vegetation in the Big Shell Lake area generally consisted of:

- Cultivated lands with patches and windrows of trembling aspen, spruce and shrub communities.
- Upland sites with shrub and grassland communities.
- Riparian areas containing various willow species, red-osier dogwood, trembling aspen, spruce and balsam poplar.
- Wetlands- cattails, hard stemmed bulrushes, reed grasses, and submerged pond weeds.

3.7 WETLANDS

Wetlands are land saturated with water long enough to promote the formation of water-altered soils, the growth of water-tolerant vegetation, and various kinds of biological activity (Environment and Sustainable Resource Development, 2013). Wetlands are productive ecosystems that play an important role in sustaining healthy watersheds by:

- Protecting water quality.
- Providing water storage and infiltration.
- Protecting shorelines.
- Providing natural storage of carbon.
- Providing wildlife habitat.
- Sustaining biodiversity.

The wetlands within the prairie pothole region were shaped by glacial ice deposits during the last ice age. As the glacial ice sheets receded, large blocks of calved ice were left behind and the weight of the remaining ice created depressions in the landscape, and as they melted low lying 'pothole' wetlands were left behind (Ducks Unlimited Canada, 2023).

Wetlands may only have water present (above the ground) for very short periods per year, or even less frequently. Wetlands instead are defined by their soils and water-dependent plant species such as cattails, rushes, sedges, and other species adapted to water saturation (Alberta Government, 2013).

Wetlands are scattered throughout the prairie pothole region and provide many ecological functions to the region including water storage and groundwater recharge, improving water quality, supporting biodiversity, wildlife habitat, socio-cultural values (hunting, fishing, gathering), and climate change mitigation through carbon sequestration (Montgomery, 2021). However, approximately 70% of wetlands in southern areas of Canada have been lost and up to 95% in densely populated areas (Kaumeyer, 2022)

There is an abundance of wetlands ranging from ephemeral to permanent in nature surrounding Big Shell Lake. Many of the upland pothole wetlands have historically experienced anthropogenic impacts

including artificial drainage, consolidation, and cultivation. Large fringe wetlands featuring emergent vegetation are present on the east side of the lake and in the sheltered coves of the lake (**Figure 5**). These wetlands play a critical role in the health of Big Shell Lake. The conservation of the remaining wetlands is important as they influence and benefit the health of the lake. Wetlands capture and store excess nutrients (such as nitrogen and phosphorus), and heavy metals, this can reduce the amount of nutrients entering the lake and improve water quality (Ducks Unlimited, 2022). Wetlands have the capacity to reduce and prevent the flooding of lakes by retaining precipitation and overland flow. (EPA, 2022).

3.8 WILDLIFE AND HABITAT

The Saskatchewan Conservation Data Centre (SKCDC) is responsible for tracking, evaluating, and categorizing species according to their ecological status in Saskatchewan. A review of the SKCDC online database yielded ten known occurrences of species at risk within 5 km of Big Shell Lake. These species and their associated provincial, federal, and COSEWIC statuses are shown in **Table 1**.

Table 1: SKCSC Species at Risk Historically Identified within 5 km of Big Shell Lake

COMMON NAME	SCIENTIFIC NAME	HABISASK ¹	SARA ²	COSEWIC ³
barn swallow	<i>Hirundo rustica</i>	S4B (Apparently Secure – Breeding),	Threatened	Special Concern
bobolink	<i>Dolichonyx oryzivorus</i>	S5B (Secure/Common-Breeding)	Threatened	Special Concern
horned grebe	<i>Podiceps auritus</i>	S5B (Secure/Common-Breeding)	Special Concern	Special Concern
olive-sided flycatcher	<i>Contopus cooperi</i>	S4B (Apparently Secure – Breeding),	Threatened	Special Concern
osprey	<i>Pandion haliaetus</i>	S3B (Vulnerable- Breeding)	-	-
pileated woodpecker	<i>Dryocopus pileatus</i>	S3 (Vulnerable)	-	-
pine grosbeak	<i>Pinicola enucleator</i>	S2B (Imperiled/Very rare-Breeding), S4N (Apparently Secure- Non-Breeding)	-	-
turkey vulture	<i>Cathartes aura</i>	S3B (Vulnerable- Breeding)	-	-
whooping crane	<i>Grus americana</i>	SXB (Presumed extirpated-Breeding), S1M (Critically Imperiled/ Extremely rare-Migratory)	Endangered	Endangered

It should be noted that the SKCDC database is limited to recorded professional assessments that have been historically conducted in the area. Therefore, it does not offer a full or accurate representation of the species utilizing site-specific habitats.

Big Shell Lake is located in the B5 Nesting Zone of Canada, with a regional migratory nesting period of April 20 to August 25 (Government of Canada, 2018). Vegetation clearing and/or construction outside of the regional migratory bird period is recommended (i.e., prior to April 20 or after August 25).

The ecoregion is known to provide habitat for a wide range of mammals including, but not limited to, white-tailed deer, black bear, moose, beaver, coyote, red fox, and snowshoe hare.

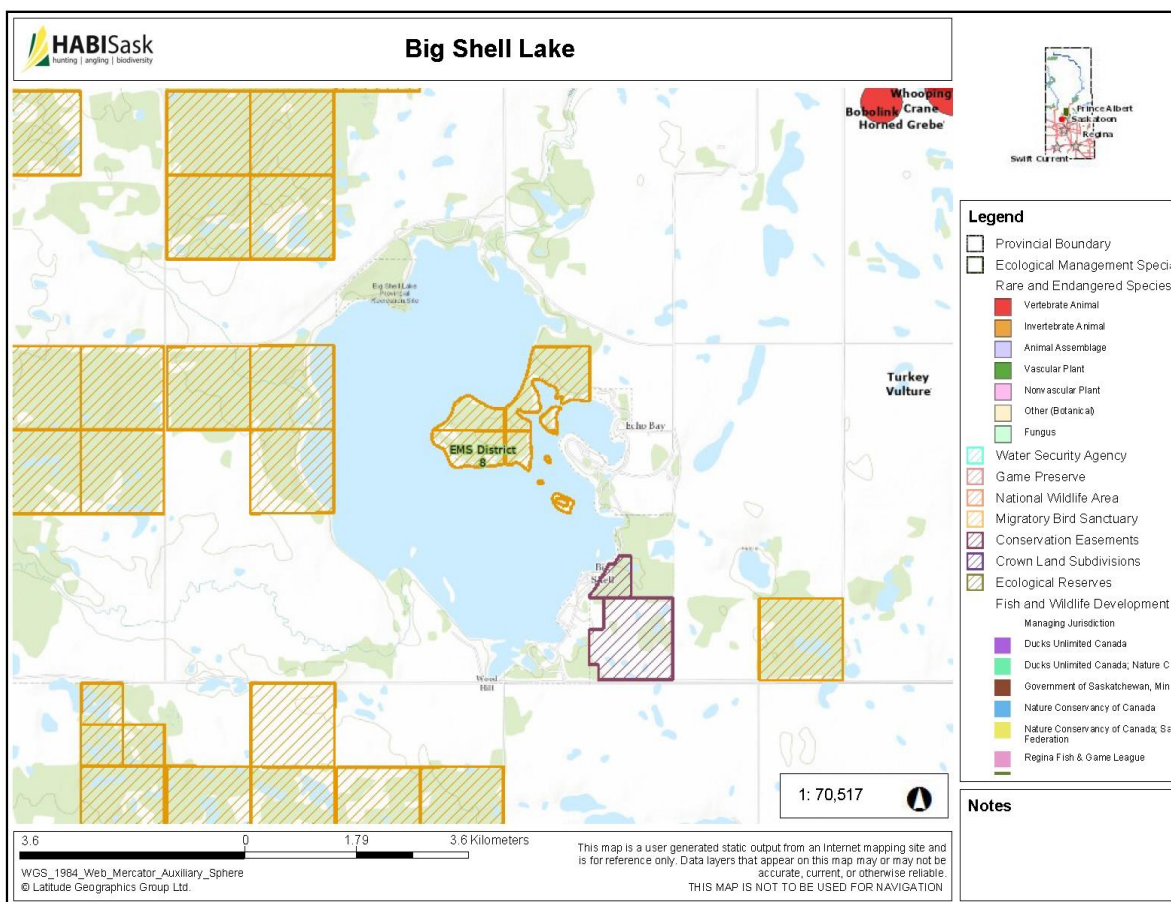
¹ Saskatchewan Conservation Data Centre (Government of Saskatchewan, 2022)

² Species at Risk Act (SARA) (Government of Canada, 2022)

³ Committee on the Status of Endangered Wildlife in Canada (Government of Canada, 2022)

Pileated woodpecker (*Dryocopus pileatus*) potentially exists within the study area and recent updates regarding habitat protection of this species has been released by Environment and Natural Resources Canada. Pileated woodpeckers are listed under Schedule 1 of the Migratory Birds Regulations 2022 and their nesting cavities are protected year-round. Should an occupied pileated woodpecker nesting cavity be identified on a Project Site, it must be avoided and protected at all times, regardless of which migratory bird species is occupying the nesting cavity. The nesting cavities of this species may only be destroyed, damaged, disturbed or removed if they have been deemed to be abandoned; that is, after a notification has been submitted through the Abandoned Nest Registry (Government of Canada, 2022) and the designated 36-month wait time has passed. In addition, the Saskatchewan Wildlife Act provides regulations to prevent the destruction of bird nests/eggs. **Figure 5** shows the areas outlined by HABISask of species around the study area.

Figure 5: HABISask Data (Source: HABISask (Environment Canada, 2022))



The lake is within the whooping crane (*Grus americana*) migratory corridor, where approximately 50% of the population travels over the area during spring and fall migration (Government of Saskatchewan, 2022) (**Figure 6**). The whooping crane is one of the rarest birds in North America. Hunting pressures and habitat loss decreased the species to 16 birds in 1941. Whooping crane now have an estimated total population of greater than 800 individuals as of 2018 (Parks Canada, 2019) with species recovery having mainly occurred as a result of widespread conservation programs. The flock that migrates near Big

Shell Lake (Wood Buffalo/Aransas Flock) is the only remaining naturally occurring migratory flock, making up 504 of the total individuals. Powerline collisions, hunting, and contaminants are some of the primary factors threatening this species. Habitat management focuses on water control, restrictions to migration and breeding grounds, and the maintenance of shallow wetlands and agricultural fields for migratory foraging (U.S. Fish & Wildlife, 2020).

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Big Shell Lake Capacity Study

Whooping Crane Stopover Site Use Intensity Within the Great Plains

Legend

- ★ Project Location

Whooping Crane Migratory Path

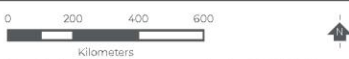
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- 75%
- 50%

Notes:

- Aaron T. Pearce, David A. Brandt, Wade C. Harrell, Kristine L. Metzger, David M. Baasch, and Trevor J. Hefley. 2015. Whooping Crane Stopover Site Use Intensity Within the Great Plains.
- Clayton E. Derby, Melissa M. Welsch, Terri D. Thorn. 2018. Whooping Crane and Sandhill Crane Monitoring at Five Wind Energy Facilities.
- U.S. Fish & Wildlife Service. 2007. Confirmed Whooping Crane Sightings.
- eBird. 2021. Whooping Crane Range Map.



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FIGURE 6

Figure 6: Whooping Crane Migratory Path



3.9 FISH AND FISH HABITAT

Database searches from HABISask indicated records of the following fish species recorded in Big Shell Lake:

- burbot (*Lota lota*).
- yellow perch (*Perca flavescens*).
- northern pike (*Esox lucius*).
- walleye (*Sander vitreus*).
- white sucker (*Catostomus commersonii*).

None of the species of fish listed are of management concern under the federal Species at Risk Act (Government of Canada, 2022) or provincial Wildlife Act (Government of Saskatchewan, 1999).

No records of fish stocking occurrences exist for Big Shell Lake.

Below is a summary of the habitat requirements for each species found within Big Shell Lake.

Burbot (*Lota lota*) prefer the bottoms of cold lakes and rivers. Typically found near larger boulders. This species spawns in winter conditions over sand or gravel (Joynt & Sullivan, 2003). Suitable habitat does exist for spawning on gravel/cobble areas on Big Shell Lake. One juvenile burbot, which appeared to be injured, was observed during the August 5th, 2022, site visit.

Northern pike (*Esox Lucius*) prefer warm water, vegetated edges of lakes and rivers with low to moderate currents. This fish species spawns in early spring in heavily vegetated shallow bays (Joynt & Sullivan, 2003). Big Shell Lake provides very suitable habitat for northern pike in the highly vegetated shorelines and shallow bay areas.

Walleye (*Sander vitreus*) is commonly found in large rivers and deep lakes. This species spawns in the spring in moderate to fast flowing water or over rocky shoals in lakes (Joynt & Sullivan, 2003). Potential spawning habitat may exist in Big Shell Lake along the shoreline areas with gravel/cobble substrate. In addition, Aspen Ridge Creek and the outlet stream may provide spawning opportunities for walleye.

White sucker (*Catostomus commersonii*) is a widely distributed species which spawns from May to July and migrates to shallow lakeshores or tributaries to spawn over gravels (Joynt & Sullivan, 2003). Suitable spawning habitat exists on gravel/cobble portions of the lake as well as Aspen Ridge Creek and the outlet stream.

Yellow perch (*Perca flavescens*) are often found in lakes. This species spawns in early spring in shallow sheltered vegetated areas in tributaries (Joynt & Sullivan, 2003). Big Shell Lake provides suitable habitat for yellow perch, particularly in shallow areas with abundant emergent/submerged vegetation. Yellow perch were observed utilizing shoreline areas during the field visits.

3.10 RIPARIAN HABITAT ASSESSMENT

Prior to the field assessment, a review of available database information, historical aerial and satellite imagery was conducted. This was done to estimate the ecological character and spatial extent of landscape features, vegetation, and wildlife habitat for the Big Shell Lake shoreline, streams, fringe wetlands, and uplands.

The *Field Guide to the Ecosites of Saskatchewan's Provincial Forests* (McLaughlan, 2010) was utilized to classify ecosites. The study area falls within the Boreal Plain (BP) ecozone which covers central Saskatchewan separating the Prairie from the Boreal Shield. This general classification separates large areas based on climate, landforms, and regional vegetation patterns. Ecosites are more specific descriptions that can be applied at a local level, providing general site characteristics and vegetation communities.

The habitat field assessment was conducted on August 5, 2022, to confirm and refine these observations. Vegetation survey plots were selected to gain general habitat character that could then be applied to areas with similar landscape and vegetation community characteristics around the lake. Due to time and access restraints, detailed vegetation surveys were limited to easily accessible areas. Passive survey observations along the shoreline were used to confirm ecosite characteristics where possible.

The study area, excluding developed, disturbed, and agricultural land use segments, fall within five (5) ecosite descriptions. Each location is distinct and can include habitat variability even within a small area. The descriptions provided below will have some overlap and may have vegetation species that are not listed in the ecosite descriptions.

BP6 Trembling Aspen/beaked hazel/sarsaparilla: Fresh Loamy Sand

BP6 ecosites occur as pure or nearly pure stands of aspen (*Populus tremuloides*). White spruce (*Picea glauca*) or white birch may consist of up to 10% of the canopy. The understory species composition is prickly rose (*Rosa acicularis*) and Saskatoon (*Amelanchier alnifolia*), but BP6 will have relatively higher proportions of lowbush-cranberry, wild sarsaparilla, and beaked hazel. Moss and lichen cover is relatively low and leaf litter is relatively high.

The BP6 tends to be moister than B5 and includes a wider range of incidental tree species. BP6 ecosites also exhibit higher productivity levels for aspen than BP5 ecosites. Following stand-replacing disturbances such as fire or forest harvesting, these ecosites usually return to their former condition. In the absence of disturbance, these ecosites may transition toward the conditions observed on BP9.

BP15 Balsam poplar – white spruce/feathermoss: Very moist silty loam

BP15 ecosites generally have a canopy that has balsam poplar leading in combination with white or black spruce. Trembling aspen, white birch, and/or balsam fir also sparse in the canopy. Both the shrub and herb layers tend to be diverse, and a conspicuous layer of feathermosses is apparent above the layer of leaf litter.

This ecosite has a consistently high diversity of shrub and herb species and will also support a wide variety of tree species. Following disturbance, these ecosites may return to their former condition although they may also resemble BP6 or BP7 if their previous stand condition had sufficient aspen. In the absence of disturbance, these ecosites may more closely resemble BP9 or BP13 as succession unfolds.

BP17 Manitoba maple - balsam poplar/ostrich fern: moist silty clay loam

All BP17 ecosites have Manitoba maple in the canopy, and also commonly contain balsam poplar, white elm, green ash and/or trembling aspen. This ecosite has diverse shrub and herbaceous layers which include red-osier dog wood, bedstraw species, and ostrich fern.

Green ash is typically sporadic and cover values are relatively low. In the absence of disturbance, these sites may slowly migrate toward ecosite BP15, provided the white spruce component was sufficient. However, it is possibly more likely that the canopy will continue to thin, and the tall shrub understory will become more prominent. Following disturbance, it is likely that the Manitoba maple and balsam poplar will readily recolonize the site from stump sprouts.

BP25 Willow shrubby rich fen: Wet humic organic

BP25 ecosites have characteristically high cover values of willow. The typical willows associated with this site are pussy willow and flat-leaved willow. Other shrubs that may be found on the site include dwarf birch, northern gooseberry, northern red current, and alder-leaved buckthorn. Shrubby rich fens also tend to have more open water at the surface than shrubby poor fens (BP24). In the Boreal Plain ecozone, willow shrubby rich fens commonly occur on organic soils.

Willow shrubby rich fens differ considerably from leatherleaf shrubby poor fens (BP24). Rich fen ecosites often occur adjacent to streams and lakes. They may also occur as part of a swale or draw. In the absence of disturbance these ecosites are self-sustaining. Following disturbance, they will likely return to their former composition or may more closely resemble an open fen (BP27) condition.

BP26 Graminoid fen: Wet humic organic

Graminoid or sedge fens often support various sedge species and sometimes marsh reed grasses. They generally lack tree and shrub cover. Graminoid fens usually have water at or near the surface, which accounts for the presence of water smartweed, yellow marsh marigold, and marsh skullcap. While graminoid fen ecosites are usually associated with organic soils, they may also occur with mineral substrates.

BP6 BP26 Graminoid fen: Wet humic organic along Big Shell Lake shoreline (Source: Urban Systems)



Graminoid (sedge) fens are occasionally found across the Boreal Plain ecozone. They are often near lake shorelines but can also form a relatively continuous wet meadow. These sites deviate little from their original condition either in the presence of or absence from disturbance.

BP28 Seaside arrow-grass marsh: Very moist humic organic

BP28 ecosites commonly contain a variety of graminoid and small herbaceous species, including reed grass, seaside arrow-grass, water sedge, awned sedge, and foxtail barley. The substrate for BP28 ecosites can be either organic or mineral soil.

Seaside arrow-grass marshes are commonly described as meadow marshes owing to their abundance of grasses and sedges. These ecosites are very species diverse and it is not uncommon to encounter water hemlock, common cattail, stinging nettle, or curled dock (an introduced species) on these sites. These ecosites often occur at the margins of small ponds and are affected by changes in water level that lead to alterations in species composition as water-loving species come and go with the fluctuating moisture regime.

3.11 HABITAT DELINEATION

Following the field study, publicly available Google Earth aerial imagery (Google Earth Pro, 2021) was used to delineate different habitat features along the shoreline and adjacent uplands of the study area. Habitats that share common characteristics and habitat values are grouped together and areas under agricultural land use are not delineated due to their relatively low habitat value. Due to the scale of the assessment, in most cases, there is some overlap of ecosite occurrence within each delineation. Small wetlands and ephemeral watercourses are common throughout each of the upland classification groups.

Figure 7 (page 26) provides habitat delineations identified in the study area.

Un-delineated lands within the study area are assumed to be managed under agricultural practices, either cultivated or rangeland pasture, and several farmyards noted within the study area are identified in Figure 7. These areas are presumed to have minimal habitat for native vegetation or wildlife.

The character of each habitat type is provided below.

Developed Areas

Developed areas include residential and cottage community developments, although some overlap of available habitat exists. These are areas of higher disturbance and contain an increased distribution of introduced ornamental, cultivated, and invasive species. However, many developed lots are situated within or adjacent to forested areas that include the BP15, and BP17. Further description of where these ecosites occur around the lake are described below.

Developed Area habitats have the potential to contain nesting habitat for barn swallows and roosting/hibernacula habitats for little brown myotis. These areas typically have lower risks for contravention of wildlife regulations because of their lower quality habitats and associated species.

Development along shoreline in RV of Big Shell (Source: Urban Systems)



Forested

Forested areas around the lake generally fall into the BP15, BP17 -and the BP5 ecosites. The BP15 ecosite is more prevalent along the northern shorelines and in low wetter areas around the lake.

Forested and windrow areas in upland areas of the lakes are typically BP5 Trembling aspen/prickly rose/grass. Stands of trembling aspen and related communities are generally made up of dense colonies of small to medium-sized trees.

BP5 Trembling aspen/prickly rose/grass along Big Shell Lake Shoreline (Source: Urban Systems)



Tree and Shrub habitats have the potential to contain nesting habitat for evening grosbeak and rusty blackbird. These areas have a high potential to be considered “complex habitat” for migratory birds, which increases the risk of contravening the *Migratory Birds Convention Act* or causing construction delays. The regional migratory bird period for this habitat is April 20 to August 25 (Government of Canada, 2018).

Low shrub

In many cases across the upland landscape, smaller streams and ephemeral watercourses have formed small gully features within the tree and shrub habitat areas. These provide suitable conditions for the development of important habitats and migration corridors for ungulates and other mammals, as well as important nesting areas for birds. Low wet basins within the tree and shrub areas may provide conditions suitable for occurrence of BP28 or other treed swamp habitat types.

BP6 Trembling Aspen/beaked hazel/sarsaparilla: Fresh Loamy Sand along Aspen Creek inlet (Source: Urban Systems)



Wetland and Emergent Vegetation

Multiple wetlands and drainage features were identified bordering Big Shell Lake, and many show direct hydraulic connectivity to the lake. Wetlands vary in ecological character, size, and complexity, and many of them are currently in a transitional ecological state due to the elevated water levels. This transitional state has created unique ecosite characteristics and are not accurately defined within the ecosite system. Standing deadfall within wetland areas is abundant and includes various tree and shrub species of all ages, in a variety of water depths. This habitat provides unique cover and resources for a variety of terrestrial and aquatic plant and animal species.

A second type of habitat included in the delineation, and not described by the ecosite system, is the large fringe areas of emergent vegetation, primarily hard-stemmed bulrush (*Scirpus acutus*). Much of the undeveloped waterfront has a large fringe of this type of habitat of varying width before the transition of submergent vegetation. Submergent vegetation was not mapped but is generally observed in shallow waters.

Wetlands and stream systems tend to flood and draw down seasonally and during precipitation events. Fluctuation of water levels within these systems allows for the establishment of a more diverse wetland vegetation community, many of which depend on inundation and drawdown of water as part of their life cycle. The outer edges of fringe wetlands, ephemeral watercourses and tributaries are often BP25, with water-tolerant willow species, is common on low ground and ephemeral draws. Along the inside edge of this habitat in the transitional zone to the water BP26 supports large swaths of sedge and graminoid species.

Smaller closed basins that are seasonally inundated but tend to draw down over the summer season leaving behind pools and saturated organic soils support BP28 habitat. This type of habitat is common within agricultural fields, and flooded fringe areas with poor drainage.

In the transition to upland areas along the shoreline of Big Shell Lake that do not express fringe wetlands is a thin band of colonizing facultative grass and forb species such as reed grass and mint. Nettles, sedges and timothy often separate the shoreline from the adjacent upland habitat type.

The agricultural lands adjacent to Big Shell Lake feature a significant number of small to large wetland areas with varying degrees of connectivity to the greater watershed. Wetlands in cleared agricultural lands will tend to have graminoid marsh characteristics composed of mainly sedges and grasses. Depending on the proximity of agricultural disturbance there is potential for shrubby communities along the upland edges and drainage features.

Wetland and Emergent Vegetation habitats have the potential to contain nesting habitat for western grebe, whooping crane, and yellow rail. These areas have a high potential to be considered “complex habitat” for migratory birds, which increases the risk of contravening the *Migratory Birds Convention Act* and/or Saskatchewan Wildlife Act or causing construction delays. The regional migratory bird period for this habitat is April 20 to August 17 (Government of Canada, 2018). These Wetland and Emergent Vegetation habitats are common along the Big Shell Lake shoreline and provide excellent habitat for waterfowl and other shoreline nesting birds.

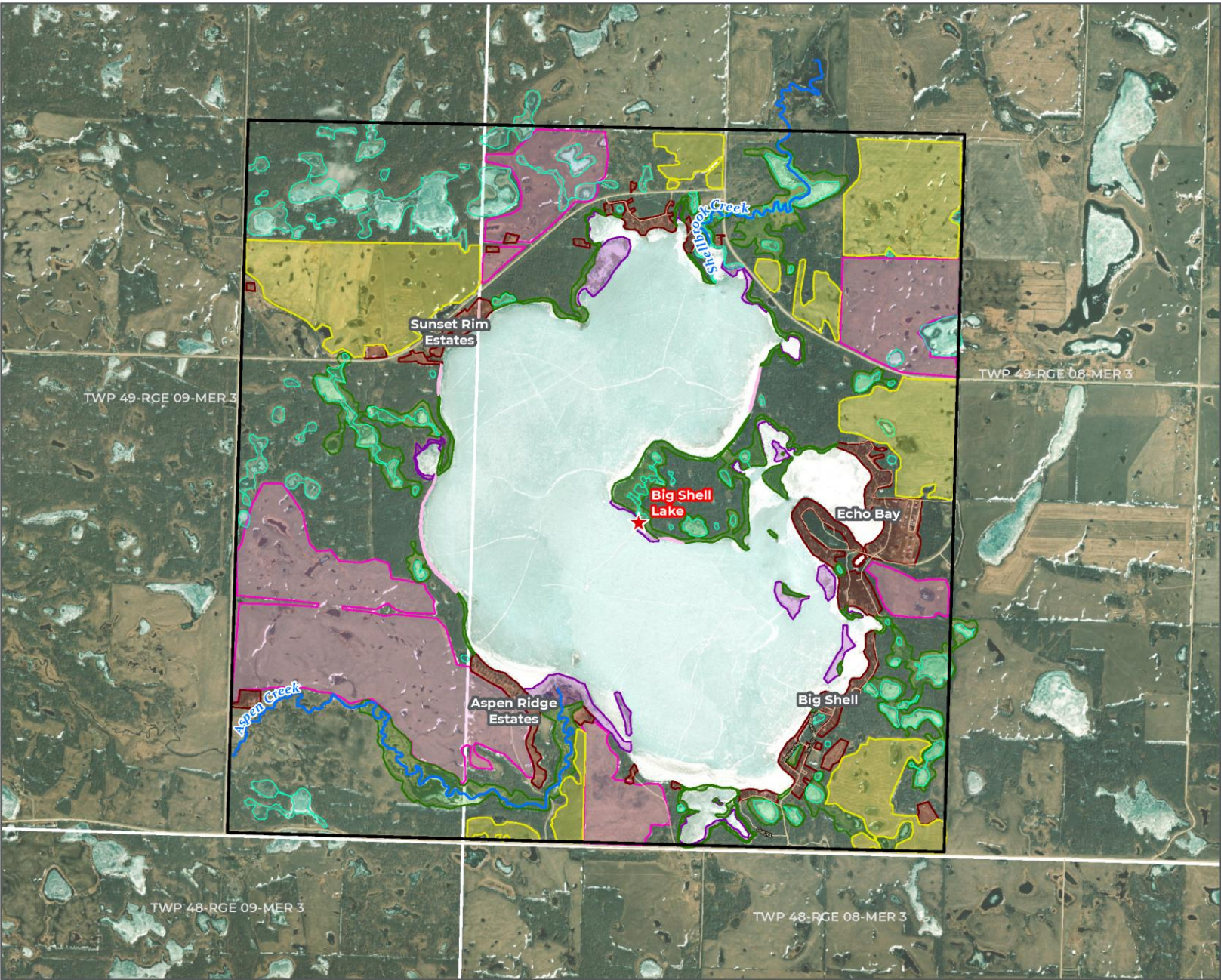
BP28 Seaside arrow-grass marsh: Very moist humic organic along Shellbrook outlet (Source: Urban Systems)



BP6 BP26 Graminoid fen: Wet humic organic along Big Shell Lake shoreline (Source: Urban Systems)



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Big Shell Lake Capacity Study Lake Habitat Study

- Legend**
- ★ Project Location
 - Streams
 - Habitat Assessment Area
 - Cultivated
 - Developed
 - Emergent Vegetation
 - Pasture / Cleared
 - Riparian Vegetation
 - Rocky Shoreline
 - Wetland

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Coordinate System: NAD 1983 UTM Zone 13N
Scale: 1:25,000
 (When plotted at 11"x17")

Data Sources: - Data provided by the Government of Canada and ESRI.

Project #:	5268.0001.02	URBAN SYSTEMS FIGURE 7
Author:	SP	
Checked:	SK	
Status:	Review	
Date:	2023 / 7 / 13	

Figure 7: Habitat Delineation

3.12 PUBLIC ENGAGEMENT FEEDBACK REGARDING ENVIRONMENT

Results from the public survey revealed that 36% of survey respondents have environmental concerns at Big Shell Lake that speak to the following themes.

Shoreline Erosion

A significant number of survey respondents stated concerns about shoreline erosion. The large waves from wake boats have begun to erode the natural shoreline of Big Shell Lake. Property frontages are being eroded from constant waves hitting the shoreline. The high number of wake boats is a common concern among lake users. In addition to shoreline erosion, the number of wake boats add to safety concerns and contributes to noise pollution.

Pollution and Waste

There were numerous reports of an increase of waste found in the lake and along the shoreline from survey respondents. It is observed that not all lake users follow proper waste disposal protocols in open spaces on the land and the lake. Gas from the boats have spilled into the lake as well, producing a “rainbow shine” that has become increasingly noticeable. Lake users describe a significant decrease in water quality over the years. Increase in algae blooms and weed beds are suspected to be a result of fertilizer and nitrogen from agricultural and lawn runoff.

Wildlife Population

Changes in wildlife population have been noted among lake users, specifically with the bird population. Lake users are noticing a decrease in loons, pelicans, and the heron population. The beaver population has increased significantly. Survey feedback noted that beavers are rapidly taking down vegetation, altering the shoreline, and causing flooding.

Results also showed that 23% of survey respondents are aware of environmentally sensitive areas in Big Shell Lake. Some of these areas include:

- Nesting areas and wildlife habitats for birds, especially loons and herons.
- Marsh areas.
- Fish spawning zones.

The majority of survey respondents expressed concern over motorboats disturbing loon and heron nesting bays that exist in a marsh area in the far west bank of the lake. Survey respondents describe another loon nesting area surrounding the two small islands. They state that these areas should be protected from boaters and development as loon populations have been noticeably decreased from the area. These areas are described as marshy and low-lying. This same area in the west bank of the lake is also stated to be a fish spawning area which should be protected to aid the declining fish populations.

4.0 LAKE WATER QUALITY REVIEW

A limited water quality sampling program was undertaken to determine the status of the water quality in Big Shell Lake and how this water quality changed throughout the year. Water quality in the lake can help to understand how land use and development may be affecting the lake. If the results indicate adverse effects, there may be steps that can be taken to protect and preserve the ecological and recreational attributes of the lake. In addition to the sampling program, a review of available historical water quality information was completed. In 1998, Saskatchewan Environmental and Resource Management conducted a *Big Shell Lake Water Quality Assessment* (Saskatchewan Environmental and Resource Management, 1998). Details of the report are described in **Section 4.1**.

Sampling of Big Shell Lake was scheduled to occur on 4 occasions over the period of 14 months. The aim of the sampling program was to provide an understanding of the water quality of the lake and how this water quality may change throughout the year.

Water quality data from Big Shell Lake were compared to the Saskatchewan Surface Water Quality Objectives (Water Security Agency, 2015) and the Canadian Council of Ministers of the Environment (CCME) Water Quality Guidelines (Canadian Council of Ministers of the Environment, 2023). As fisheries and recreation are the most common uses for Big Shell Lake, the data were compared to provincial objectives and federal guidelines for both the protection of aquatic life and for recreational use/aesthetics. The assessment of water quality in Big Shell Lake was based on the most stringent guideline available. It is important to note that both the provincial objectives and federal guidelines have no legal standing and serve as a guide for issuing permits, licences, and orders and for maintaining designated water uses.

Four water quality sampling events were conducted at each sampling location on April 1st 2022, August 4th 2022, October 7th 2022, and June 23rd 2023. The lake was sampled at 4 locations (Sunset Rim, Aspen Ridge, Big Shell and Echo Bay) (**Figure 8**) and the data have been compared with federal (CCME) and provincial guidelines (Water Security Agency, 2015), where guidelines exist.

These locations were kept consistent for each monitoring event. **Table 2** below summarizes the dates when the monitoring events were conducted and the monitoring event objectives.

Table 2: Water Quality Monitoring Event Objectives

MONITORING EVENT	OBJECTIVES
April 1, 2022 (winter)	To provide an indication of water quality, including oxygen conditions and nutrient releases from sediments, while under ice cover.
August 4, 2022 (summer)	To provide information on algal growth and type and nutrient limitations/increases as conditions moved into peak productivity.
October 7, 2022 (fall)	To gather further information during fall turnover conditions.
June 23, 2023 (spring/early summer)	To collect data during spring lake turn-over and when temperatures were transitioning to becoming conducive to algal growth.

Fall and spring lake turnover is a natural phenomenon that occurs on most lakes deeper than 3 m. When clear, warmer, oxygen rich water at the surface of a lake reaches its maximum density at around

4°C, it moves to the bottom of a lake. This action displaces the cool nutrient rich water forcing it to the surface. This process naturally cycles nutrients to the surface, and oxygen rich water to the depths, which is important to the lake's ability to support life.

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 U:\Projects\544\544001\01\01_02\GIS\Project\Info\Project\544_0001_02_Big Shell Lake_Environmental_20230707.aprx | Big Shell Lake - Environmental - 20230707.aprx | Fig. 8 - Sample Locations - 20230712



Big Shell Lake Capacity Study

Water Sampling Locations

- Legend**
- ★ Project Location
 - 💧 Water Quality Sample Location

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Coordinate System: NAD 1983 UTM Zone 13N
Scale: 1:20,000 (When plotted at 11"x17")

Data Sources:
 - Data provided by the Government of Canada and ESRI.

Project #: 5268.0001.02
 Author: SP
 Checked: SK
 Status: **Review**
 Revision: A
 Date: 2023 / 7 / 13



FIGURE 8

Figure 8: Water Sampling Locations

4.1 BACKGROUND WATER QUALITY ASSESSMENT

In 1998, Saskatchewan Environmental and Resource Management conducted a *Big Shell Lake Water Quality Assessment*. The program was conducted from May to November and samples were collected monthly. There was a total of 12 sample sites, 3 of which were located in Big Shell Lake and the remaining sites were from the surrounding tributaries. Key findings from the water quality assessment include:

- There is a source of nutrient loading to the lake from external sources likely in the form of stream flow.
- Based on the nutrient concentrations, the lake undergoes eutrophication in the summer, leading to a notable decline in oxygen levels in the deeper sections of the lake. This decrease in oxygen will prompt fish and other aquatic life to either relocate to regions with adequate oxygen for survival or for the species to become nonexistent.
- It is advisable to conduct a comprehensive assessment of the nutrient inputs in order to accurately measure and characterize their origins.

Depending on the parameters, results from the 1998 assessment were compared to the results obtained by Urban Systems in this water quality assessment.

4.2 WATER QUALITY SAMPLING RESULTS

Water quality results were compared to the Canadian Council of Ministers of the Environment *Canadian Water Quality Guidelines for the Protection of Aquatic Life* (Canadian Council of Ministers of the Environment, 2023) or the Saskatchewan Water Security Agency *Surface Water Quality Objectives for Recreation and Aesthetics* (Water Security Agency, 2015) depending on the parameters.

4.2.1 WATER CLARITY AND PRESENCE OF SUSPENDED SOLIDS

Water clarity and the concentration of total suspended solids (TSS) can not only impact the esthetic and recreational value of the waterbody, but also be an indicator of nutrient levels within the lake. In April, TSS concentrations were below the analytical detection limit for all sites, and generally increased into October before decreasing again in June 2023 with concentrations being below the analytical detection limit. Throughout the 14 months, water quality met the provincial water quality guidelines for recreational use/aesthetics (minimum Secchi depth of 1.2 m) and remained relatively consistent throughout all monitoring locations for each sampling event. Similarities were observed in 1998, where Secchi depth met the minimum depth (1.2m) throughout the sampling program.

4.2.2 CHLORIDE

Freshwater lakes naturally contain low concentrations of dissolved salts including chloride. Chloride is an essential ion that flora and fauna require in small amounts for normal cell function (Government of Alberta, 2023). High concentrations of chloride can inhibit cell function by causing the cells or organisms to lose water and become deprived of nutrients. Chloride can originate from various sources, both natural (such as mineral deposits) and anthropogenic (de-icing salts, dust suppressant on roads, and agriculture inputs) and is often utilized as an indicator of increasing urbanization in a watershed (Canadian Council of Ministers of the Environment, 2011). The data for all monitoring events and all monitoring sites indicate there was consistency throughout the sampling events, with the chloride concentrations being similar and significantly lower than the CCME guidelines (640 mg/L maximum, 120 mg/L long-term). The 1998 report did not specifically sample for chloride.

4.2.3 NITROGEN

There were no significant changes in the total nitrogen concentration during summer 2023, compared with the 2022 summer, fall and winter data, with the exception of nitrate at the Sunset Rim and Big Shell locations for the fall and winter monitoring events, respectively. Throughout the 14 months, the main component of nitrogen continued to be organic nitrogen, which is typical for natural ecosystems. Ammonia continued to be present in low amounts for all sites during the summer 2023 monitoring event. The ammonia concentrations (as un-ionised ammonia) continued to be below the CCME/provincial guidelines and, although the concentrations were still higher than those observed in the fall and winter, there had been a slight reduction, compared with the 2022 summer monitoring event. The decrease in the un-ionised ammonia concentration was largely related to a decrease in the pH. Nitrite and nitrate concentrations had minimal variability throughout all sites and all seasons and were below the CCME guidelines for aquatic life. Therefore, there are no concerns with the presence of nitrogen and the associated impact on aquatic life. The 1998 study did not identify exceedances of nitrate/nitrite within Big Shell Lake. However, exceedances were noted in samples taken in the tributaries to the lake.

4.2.4 PHOSPHORUS

Phosphorous is an essential nutrient for aquatic flora and fauna. However, excessive phosphorous in lakes can cause increased growth of aquatic plants and algae (Canadian Council of Ministers of the Environment, 2004). Orthophosphorus is the form of phosphorus which is readily biologically available for algal growth. For all sites, the concentration of orthophosphorus was close to or below the analytical detection limit for all four sampling events. The data indicates that phosphorus was mainly present as particulate matter at all locations. Based on the CCME trophic definitions, Big Shell Lake would be defined as in the mesotrophic to meso-eutrophic range, trending towards eutrophic during peak productivity in the late summer. Therefore, the nutrient status of the lake is generally increasing to becoming more nutrient-rich through the year. Similarities were observed in 1998, where in May Big Shell Lake was in mesotrophic state and progressed to a eutrophic state in August. Trophic status refers to the overall level of biological productivity within a lake and is a key characteristic of water quality (Government of Alberta, 2023). **Table 3** demonstrates the phosphorous trigger ranges for Canadian lakes and the associated trophic status.

Table 3: CCME total phosphorus trigger ranges for Canadian lakes and rivers

TROPHIC STATUS	CANADIAN TRIGGER RANGES TOTAL PHOSPHORUS (µG/L)
Ultra-oligotrophic	<4
Oligotrophic	4 to 10
Mesotrophic	10 to 20
Meso-eutrophic	20 to 35
Eutrophic	35 to 100
Hyper-eutrophic	>100

4.2.5 ALGAL GROWTH

Algae are a natural part of all aquatic ecosystems, but prolific growth can cause a dense mass of algae (a bloom) to form. Anthropogenic activities such as agricultural run-off increases nutrient

concentrations and can contribute to algal blooms. Algal growth can change throughout the year, with the type of algae and the rate of growth and accumulation being affected by a number of different factors. The presence and availability of nutrients (nitrogen and phosphorus) is one of the key factors. Nitrogen limitations can result in the ability for blue-green algae (cyanobacteria) to predominate over green algae. The data for all monitoring events and all monitoring sites indicate that phosphorus is the limiting nutrient, which allows a bias toward green algal growth rather than blue-green algae predominating. The lowest concentration of algal biomass occurred in April and generally increased into August and then drastically increased into fall, before decreasing again in June 2023. Algal growth can continue into the fall as long as water temperatures are suitable to allow growth to occur. The 1998 study did not sample for chlorophyll a, therefore a comparison cannot be made. However, that study indicated a similar trend that phosphorus is a limiting nutrient and therefore, algal growth would likely be limited to green algae.

4.2.6 CAFFEINE

Numerous chemical compounds have been identified as potential markers for human impacts on the environment. These chemicals are known to be associated with humans either directly (through consumption/use) or indirectly (e.g., through metabolism), with the ideal being their persistence and ability to move through a receiving environment. Caffeine is one such substance. Sampling for caffeine was completed during the summer 2022 and fall 2022 monitoring events, with the concentrations being below the analytical detection limit in the summer and above the analytical detection limit in the fall at all locations. This represents an increase in the caffeine concentration, compared with the summer 2022 monitoring event. Caffeine was not sampled in winter 2022 and summer 2023, nor was it sampled in 1998. The presence of caffeine indicates an anthropogenic influence on the lake.

4.2.7 BACTERIOLOGICAL

Faecal coliforms and *E. coli* are indicative of the presence of faecal matter. Total coliforms are a general group of micro-organisms that are ubiquitous in the natural environment and are not necessarily associated with the presence of faecal matter. The total coliform concentrations continued to increase through the data set, with the highest concentrations being in June 2023 at all sites. However, the concentrations of the faecal micro-organisms remained low with most data points being below the analytical detection limit at all sites. The highest concentrations continued to be associated with total coliforms, which would be expected due to the generic and widespread nature of this group of bacteria. Similarities were observed in 1998, where bacteriological results met the Surface Water Quality Objectives at all locations sampled.

4.2.8 DISSOLVED OXYGEN, TEMPERATURE AND DEPTH

Temperature affects many chemical and biological processes; for example, chemical equilibrium constants, solubilities, and the rates of chemical reactions are temperature dependent. Temperature profiles were taken at each sampling location for the 2022 sampling events, with the depth for the four sites being between 12 and 17 m. At all four locations, the temperature stayed consistent with depth. In June 2023, temperature was taken at one single point within the water column. Lowest temperatures were observed at the coldest times of the year and highest temperatures at the warmest time of the year. There was little difference in temperature between the 4 locations regardless of the time of the year. Dissolved oxygen (DO) was not sampled in summer 2023 due to equipment malfunctions.

For the 1998 and 2022 sampling events there was a decrease in DO concentration with depth, with the concentrations changing from being able to sustain fish life in the upper parts of the lake to levels which would be inhibitory to fish survival occurring towards the bottom of the lake. According to the 1998 assessment, seasonal changes influenced DO concentrations, this was also the case in 2022, with slight increases in August and October. Although the maximum DO concentration was above the guideline (6.5 mg/L), this was not the case for the average concentration through the lake profile.

Trends throughout the 2022/2023 monitoring events are summarised in **Table 4**, with notes below for clarification.

Table 4: Data Interpretation Summary

PARAMETER	DATA OUTCOME			
	APRIL 2022	AUGUST 2022	OCTOBER 2022	JUNE 2023
TSS	-	-	↑	↔
Chlorophyll a	-	↑	↑	↓
Secchi depth	-	↓	↓	↑
Chloride	-	↓	↔	↔
Ammonia	-	↑	↔	↑
Nitrate	-	↓	↓	↔
Nitrite	-	↔	↔	↔
Organic Nitrogen	-	↑	↑	↔
Total Nitrogen	-	↓	↑	↔
Trophic Status	-	↑	↑	↔
Orthophosphorus	-	↔	↓	↔
Caffeine	-	-	↑	-
Faecal micro-organisms	-	↔	↑	↔
Dissolved Oxygen	-	↑	↑	-
Temperature	-	↑	↑	↑

↑	Increasing trend
↔	No increase or decrease
↓	Decreasing trend
	Within guideline criterion
	Exceeds guideline criterion
	No guidelines apply

4.2.9 WATER QUALITY CONCLUSIONS

Based on preliminary data and observations, the water quality rating for Big Shell is good overall. In comparison to the 1998 assessment, the water quality does not appear to be trending downward; however, there is a significant time difference between the two sampling events. Additional sampling is recommended to continue to build upon if the lake is trending up or down in water quality. Further investigation into the water quality surrounding Big Shell Lake is also recommended.

Regular water quality monitoring can be an important tool to help understand trends. This study found consistent data across the lake at each sampling location. As such it is reasonable to assume that future data could be collected from just one of the locations and still be considered representative of the lake as a whole.

4.3 POTENTIAL SOURCES OF CONTAMINATION

Concerns raised about the water quality in Big Shell are based on algal blooms, varying water levels, boat use, and adjacent land use. Available information was reviewed to determine if any recorded contaminated sites occurred within the Big Shell area.

4.3.1 FEDERAL CONTAMINATED SITES INVENTORY

The Treasury Board of Canada's Federal Contaminated Sites Inventory was searched on July 19, 2023 (Government of Canada, 2023). No suspected, active, or closed contamination sites were identified at or within 5 km of Big Shell.

4.3.2 ENVIRONMENTAL ASSESSMENT

A search of the Government of Saskatchewan interactive mapping environmental assessment layer was conducted on July 19, 2023 (Government of Saskatchewan, 2021). One environmental assessment historical project (project number 2006-108) was identified on the southwestern corner of Big Shell. Project details include:

- Project description: Cottage subdivision development on Shell Lake, NW 06-49-08 W3M, RM of Spiritwood #496.
- Project status: No further screening required.
- Date completed: October 22, 2006.

4.3.3 SOLID WASTE MANAGEMENT

The Government of Saskatchewan interactive mapping solid waste management layer was searched on July 19, 2023 (Government of Saskatchewan, 2021). Two positive results were identified, one on the east side of Big Shell (Site name: Echo Bay) which is approximately 535 m from the shores of Big Shell Lake and one on the north side of Big Shell (Site name: Misty Grove, Shell Lake) approximately 371 m from Big Shell Lake. Both solid waste management types are landfills and both have a current status of closed.

4.3.4 DGM OIL AND GAS DATA

A search of Geomatics Data Management (GDM) ArcGIS map viewer was conducted on July 17, 2023 (GDM, 2022). The results indicated that there is one abandoned well (ID 150941) approximately 311 m

south of Big Shell near Wood Hill. The well is referred to as the Western Warner Shell Lake No 2 well and is operated by Western Warner Oils Ltd. There are no pipelines in close proximity (1 km) of Big Shell.

4.3.5 OTHER SOURCES OF POTENTIAL CONTAMINATION

The potential sources of contamination and/or erosion and sedimentation in the Big Shell area are listed in **Table 5**.

Table 5: Potential Sources of Contamination in the Big Shell area

SOURCE	CONTAMINANTS
Marinas, boat launches, and private docks	Hydrocarbons, sedimentation
ATV use in proximity to the lake	Hydrocarbons, sedimentation
Roads/ditches	Run-off of hydrocarbons, heavy metals, bacteriological compounds, sediment and salt/chloride.
Landfills	Leaching of hydrocarbons, heavy metals, and bacteriological compounds
Septic tanks and sewage lagoons	Accidental release of heavy metals and bacteriological compounds/nutrients
Residential use of chemicals	Cleaning agents, paints, hydrocarbons, fertilizers, herbicides, insecticides
Development and Construction Activity	Sedimentation resulting from erosion of unvegetated soils
Agricultural land use	Runoff of pesticides, herbicides, fertilizers, nutrient loading, and manure

While each of the above sources of potential contamination noted above may not have a significant impact on water quality, the cumulative effect of all these types of activities and land uses may eventually affect the water quality of Big Shell.

5.0 LAND USE AND DEVELOPMENT

5.1 POLICIES AND REGULATIONS

All development surrounding Big Shell Lake must adhere to the policies and regulations that the area's jurisdiction falls under (**Table 6**). The RV of Big Shell, RV of Echo Bay, and RM of Spiritwood all have their own planning bylaws to guide development within their respective jurisdiction. Aspen Ridge, Misty Grove, Solitude Ridge, and Sunset Rim fall under the jurisdiction of the RM of Spiritwood. Boondocks Campground is near Big Shell Lake, however, it falls under the jurisdiction of the neighbouring RM of Meeting Lake. Big Shell Campground falls under the jurisdiction of the Province of Saskatchewan.

Table 6: Policies and Regulations

MUNICIPALITY	POLICIES AND REGULATIONS
Resort Village of Big Shell	Basic Planning Statement Bylaw No. 2-85 Zoning Bylaw No. 3-85 Civic Address Map Disposal of Solid Waste Bylaw No. 8-16
Resort Village of Echo Bay	Basic Planning Statement Bylaw No. 1-87 and Amendment Bylaw No. 1-98 Zoning Bylaw No. 2-87 and Amendment Bylaw No. 1-09 Waste Disposal Bylaw No. 3-90 Water Levels Records 2013-2020
Rural Municipality of Spiritwood Aspen Ridge Misty Grove Solitude Ridge Sunset Rim	Zoning Bylaw No. 1-84 Rural Municipality of Spiritwood and Village of Leoville District Plan Road Maintenance Agreement Nuisance Abatement Bylaw Policy Relating to cash-in-lieu of Municipal Reserve dedication Building Bylaw

The following sections provide a summary of policies included in the respective planning bylaws that are directly applicable to development and land use at Big Shell Lake.

Resort Village of Big Shell Basic Planning Statement

The RV of Big Shell's Basic Planning Statement was adopted in 1985 to "ensure the protection of the quality of the environment of Big Shell Lake and to ensure orderly development for the RV of Big Shell." The Basic Planning Statement highlights the community goals, objectives, policies, and implementation measures. The areas of focus include Commercial Development, Recreational Development, Park and Open Space Development, and Residential Development. The Basic Planning Statement effectively limits development within the Village.

Section 3.1 is dedicated to Residential Development. Section 3.1.1 recognizes that there is limited potential for further cottage development. It notes that the RV of Big Shell is not in favour of additional

cottage subdivision development in the Village, except as may be approved by a majority of the electorate. Policy within this section states that council may consider limited further development within the area designated Natural Area on Map 2, and areas of Public Reserve marked A1, A2, and A3.

Section 3.2 includes objectives and policies regarding the natural forest environment and the natural buffer surrounding the lake. The RV is to provide public reserve suitable for public recreation use where not required to be dedicated as hazard lands or for environmental protection. According to the section's policies, "the area designated natural area on Map 2 shall be preserved as much as possible in its natural state with the exception of the development of limited recreational trails." Later policy states that "recreation and community facilities shall be developed within the area designated as Community Centre on Map 2."

Section 3.3 speaks to commercial development within the RV. The RV of Big Shell's primary function is to prove a residential community in a resort setting. The RV has no plans to develop into a service center and according to Section 3.3.3, commercial development shall not be permitted in the RV of Big Shell.

Resort Village of Big Shell Zoning Bylaw No. 3-85

The RV of Big Shell's Zoning Bylaw has been in place since 1985. Under the bylaw, the RV of Big Shell is divided into the following zoning districts: Residential, Urban Reserve, and Park and Community Facility.

Within the Residential district, single detached dwellings, municipal offices, public parks, and public works are permitted. Discretionary uses include home occupations and mobile homes with only one principal use permitted on a lot. Within the Park and Community Facility District, permitted uses include community halls, municipal offices, parks, playgrounds, day use picnic areas, sports field, and public works. Discretionary uses include docks, boat launch facilities and marinas. In the Urban Reserve District, permitted uses include recreation trails, natural parks, and public works. Discretionary uses include sewage lagoons, land fills, sports fields, and golf courses.

Resort Village of Echo Bay Basic Planning Statement

The RV of Echo Bay's Basic Planning Statement was adopted in 1987 and includes the goals, objectives, and policies for residential, commercial, parks, recreation, and open space development.

Section 4 of the document discusses residential development objectives and policies. It recognizes that the potential for further development of new cottage sites is very limited because of the size of the lake. The section states that "council is not in favour of added cottage subdivision development in the municipality beyond the number of lots existing in 1987" and that the remaining land should be used to provide recreational space, to serve as a buffer to the agricultural lands near the lake, and for municipal uses accessory to the functioning of the RV.

Further to this, section 4.3.6 states that "council will not consider the redesignation of land for new residential subdivision except as may be necessary to provide for a single lot in conjunction with the implementation of policy 4.3.6."

Section 5 speaks to the development of parks, development, and open space. According to Section 5.1, "council wishes to continue to develop the principal community recreational and community facility

focus within Area A on Map 1.” Policy in Section 5.3 states that “the areas designated as natural areas on Map 1 shall be preserved as much as possible in their natural state, with the exception of the development of limited recreational trails.” Further to this, Area A shall be designated as the Community Center, Area B may contain trails designated for small off-road terrain vehicles, Area C may be designated for uses such as a golf course. One of the objectives of this section is to designate an area for potential golf course development.

Section 6 of the Basic Planning Statement focuses on Commercial Development. Like the RV of Big Shell, the RV of Echo Bay is not a service center and has no plans for commercial development. The objective of the RV is to maintain the purely residential/recreational nature of the village.

Further to the Basic Planning statement, the RV of Echo Bay includes this development statement on the community website:

It is recognized that the potential for further development of new cottage sites on Big Shell Lake is very limited by the size of the lake. The Resort Village of Echo Bay considers that, with the development of the remaining subdivided lots, the desirable number of residences within the Resort Village will have been reached. Therefore, Council is not in favor of added cottage subdivision development in the municipality beyond the number of lots existing in 1987. The primary functions suitable for the remaining lands within the municipality are considered to provide recreational space, to serve as a buffer to the agricultural lands near the lake and for municipal uses accessory to the function of the Resort Village.

Resort Village of Echo Bay Zoning Bylaw No. 2-1987

The RV of Echo Bay Zoning Bylaw has been in place since 1987. Under the Bylaw, the RV of Echo Bay is divided into the following zoning districts: Residential, Park and Community Facility, and Open Space.

In the Residential District the permitted uses include single detached dwellings, municipal offices, public parks, and public works. Discretionary Uses include home occupations and mobile homes. Only one principal use shall be permitted on a lot. In the Park and Community Facility District permitted uses include community halls, municipal offices, docks, boat launch facilities, marinas, natural parks, parks, playgrounds, day use picnic areas, sports fields, tennis courts, and public works. There are no discretionary uses listed in the Parks and Community Facilities District. The Open Space District permits recreation trails, natural parks, playgrounds, and public works. Sewage lagoons, sanitary landfills, golf course, and crop farms (not including dwellings or the raising of livestock) are Discretionary Uses.

Rural Municipality of Spiritwood and Village of Leoville District Plan

The RM of Spiritwood and the Village of Leoville share a district plan, that was developed in 2015, to guide growth and development in their respective areas over the next 25 years. Sections related to Big Shell Lake include Section 4.3 Natural Hazard and Ecological Sensitive Lands, Section 4.5 Lakeshore Development, and Section 4.6 Hamlet Areas.

The objective of Section 4.3, Natural Hazard and Ecological Sensitive Lands, is to acknowledge and protect natural landscapes, environmental reserves and systems within the RM. Natural Hazard land policies focus on flooding, slope instability, and erosion. Development is prohibited within the 1:500-year flood elevation or in any potential unstable slope area. “Developers may be required to provide

professional, certified environmental, geotechnical or hydrological reports to address development hazards and may require a preliminary analysis by a professional engineer or environmental scientist to identify which hazards may exist in the area of a proposed development.” Lastly, council may refuse to authorize such developments within these lands.

According to the general policies in Section 4.5, regarding Lakeshore Development, the RM shall ensure all development is set back from natural hazard and eco-sensitive areas to ensure lakeshores are a protected natural area. The RM shall identify areas that should be set aside for retention as riparian areas to minimize disturbance to the lake and recommend buffering of the shoreline to promote retention and stability of the shoreline. In keeping with sustainable and environmentally responsible development, the RM of Spiritwood shall: “Take a lead role in educating all residents and visitors of the Best Management Practices available to ensure the quality of water and the importance of maintaining a balance between natural habitat and recreational use.”

Some lakeshore estates within the RM are identified as a Hamlet Area. This includes Aspen Ridge and Misty Grove, which are both directly adjacent to Big Shell Lake. According to general policies in Section 4.6, the growth of existing hamlet areas will be encouraged and infilling of vacant lots shall be encouraged as well. All developments shall be required to comply with the Multi-Parcel Residential policies provided in Section 4.4.

Section 4.4 Country Residential Development seeks to provide various locations for country residential acreages which do not require a full range of municipal services. This section includes General Country Residential and Multi-Parcel Country Residential development policies. Within the general policies, Country Residential subdivisions shall be encouraged to provide adequate physical separation and shall seek to minimize the loss of habitat by “retaining and incorporating natural vegetation and watercourses within their location and design.” Multi-Parcel Country Residential is defined as being greater than four developments. A comprehensive development review shall be completed by any person proposing to re-zone land for multi-parcel development. It must include site specifications and information including:

- Future major roads.
- Drainage systems and improvements required to meet non agricultural drainage requirements.
- Major open space (including unique physical) areas.
- Cultural and archeological significant areas.
- Areas requiring protection through buffering or other means.
- Major hazards such as flooding, areas of high water, and slope lands.

The policy indicates that the RM will “strive to accommodate residential growth in rural areas through lands which are designated and available for Multi Parcel Country Residential Development.” In the future land use map, the land adjacent to the northeast of Big Shell Lake is also zoned as future Country Residential.

Land surrounding northwest side of Big Shell Lake is zoned as wildlife habitat protection lands, meaning that no person shall alter wildlife habitat and ecological lands unless the alteration is permitted in the regulations or authorized by the minister. This land is protected from any type of development.

Rural Municipality of Spiritwood Zoning Bylaw

The zoning districts in the RM of Spiritwood include Agriculture/Residential, Hamlet, Highway-Commercial, and Lakeshore Development. According to the zoning district maps, land around Big Shell Lake includes Lakeshore Development and the Agriculture/Residential District.

Part VI Section 1 speaks to the Agricultural Residential District (AR). Permitted uses within this district include agricultural, grain elevators, schools, cemeteries, public utilities, historical sites, archeological sites, sawmills, oil wells, gas wells, and related development facilities. Uses that shall be permitted only at councils' discretion include private airstrips, agriculturally related commercial uses, gravel pits, gravel crushing operations, recreational uses (including sports fields, golf courses, tourists' campsites, and parks), tree nurseries, intensive livestock operations, home occupations, tourist lodges, vacation farms, and bed and breakfasts. These uses shall be permitted only in locations and under conditions specified in such resolution of council. Part VI Section 1.3.6 provides special regulations for discretionary uses including tourist lodges, vacation farms, and bed and breakfast homes.

Part VI Section 6 refers to the Lakeshore Development (LD) District. The general intent of this district is to "control the standards of development for lakeshore development uses in approved locations." Permitted uses include single family dwellings, mobile homes, and recreational uses (including picnic grounds, golf courses, sports fields, public beaches, and parks). Discretionary uses within the LD District include tourists' campgrounds, tourists' cabins, and minor commercial facilities (including grocery and general stores, service stations, restaurants and take out food establishments). These uses shall be permitted only in locations and under conditions specified in such resolution of council.

According to the regulations in Part VI Section 6.3, proposed development shall not be within 50 m (164 ft) of the shoreline of any lake, unless the council for the reasons of physical conditions in the vicinity of the shoreline, otherwise directs by resolution, and 1600 m (1 mile) from a game reserve, wildlife management area, bird sanctuary or extractive industry. The proposed development shall not be on hazard land. Additionally, the policy states that "the removal of trees within 90 m (330 feet) of a shoreline shall not be presented except for the purposes of the construction of trees."

5.2 LAND USE

Land uses around Big Shell Lake consists of a combination of residential/lakeshore development, agricultural lands, community facilities, and open recreational spaces. Most development consists of shoreline and backshore developments that includes residential and recreation land uses. A total of 351 residential lots and an additional 177 campsites were identified within the study area. Of those, an average density of 1.53 lots/acre was determined. Separately, the residential lots had an average density of 0.61 lots/acre, while the campgrounds had an average density of 3.1 lots/acre.

Table 7 provides a summary of the applicable zoning, land uses, current developments, and residential density for developed areas surrounding the lake.

Table 7: Land Use Overview

DEVELOPMENT AREA	LAND USES	CURRENT LOT NUMBERS	RESIDENTIAL DEVELOPMENT DENSITY
Resort Village of Big Shell	R - Residential, P - Park and Community Facility, UR - Urban Reserve	118 Residential Lots	0.45 lots/acre
Resort Village of Echo Bay	R - Residential, P - Park and Community Facility District, OS - Open Space District	155 Residential Lots	0.86 lots/acre
Aspen Ridge Estates (RM of Spiritwood)	LD - Lakeshore Development District	44 Residential Lots	0.32 lots/ acres
Misty Grove (RM of Spiritwood)	LD - Lakeshore Development District	34 Residential Lots	0.70 lots/ acres
Sunset Rim (RM of Spiritwood)	LD - Lakeshore Development District	11 Residential Lots	0.70 lots/acres
Solitude Ridge Campground (RM of Spiritwood)	AR - Agricultural Resource District	60 Campsites	1.63 lots/ acres
Big Shell Campground (Province of Saskatchewan)	Park - Big Shell Recreation Site	15 Campsites	6.05 lots/ acres
Boondocks Campground (RM of Meeting Lake)	AR - Agricultural Resource District	102 Campsites	1.51 lots/ acres

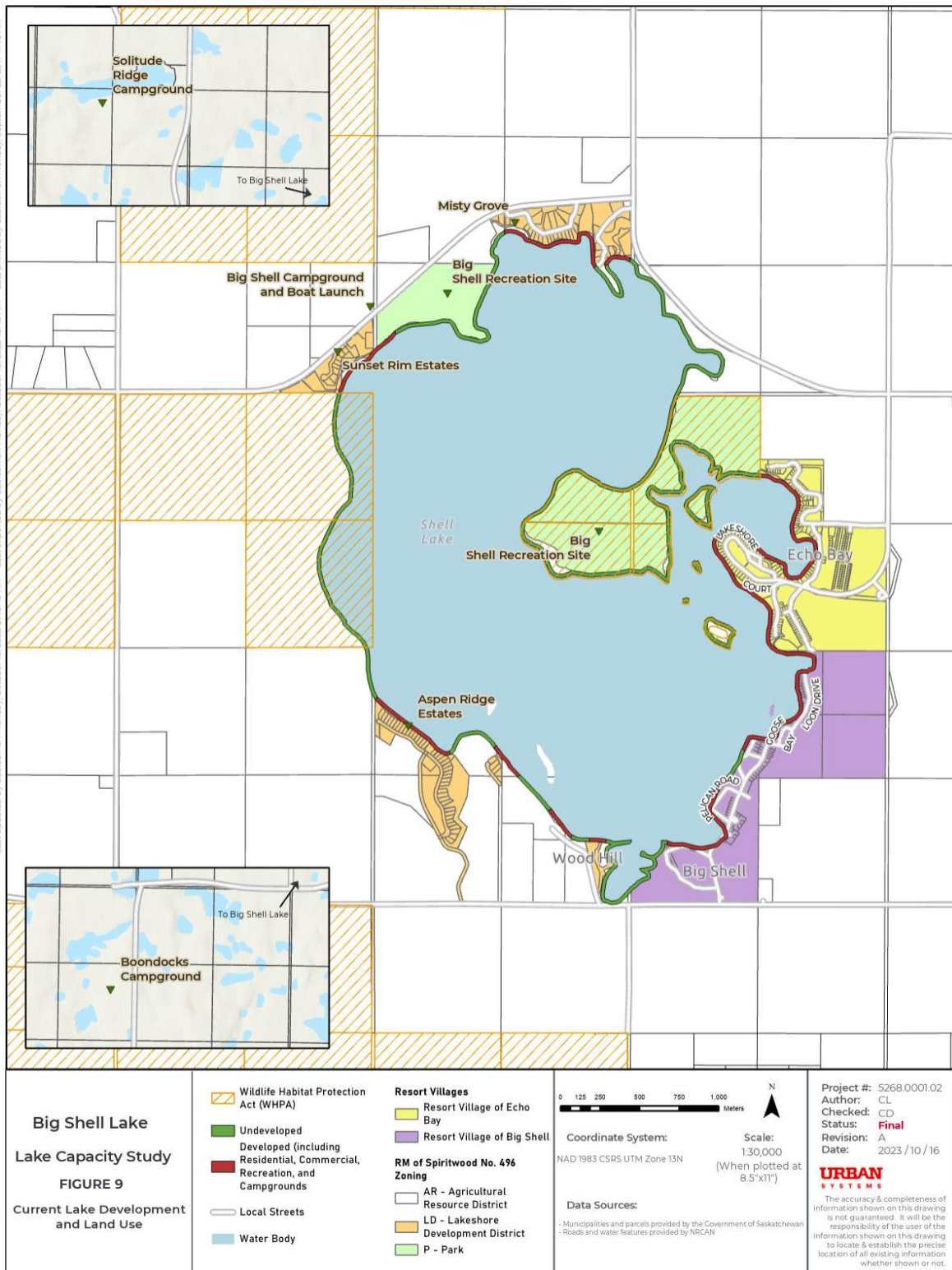
A desktop analysis of the shoreline of Big Shell Lake was undertaken to determine a ratio of developed and undeveloped lands, land uses, and zoning in Big Shell Lake. **Figure 9** shows the desktop analysis that was taken to identify the observed residential, recreation or campground developments within proximity to the lakeshore. The areas that were identified that do not include these land uses are labeled as undeveloped areas. Based on this analysis, approximately 34% of the shoreline has existing developed land uses and approximately 66% of the shoreline is currently undeveloped.

Undeveloped shoreline areas, applicable zoning, and the Wildlife Habitat Protection Act (WHPA) influence the potential for future development possibilities. **Figure 9** also illustrates previously determined developed and undeveloped areas and includes applicable zoning and environmentally protected areas.

The Big Shell Recreation Site on the east shoreline is designated under the WHPA while the recreation site on the north shoreline is not. There are also two parcels on the west shoreline that are designated under the WHPA but are zoned for Agricultural Resource. Approximately 54% of the remaining undeveloped shoreline is protected under the WHPA making further residential, commercial, or recreational development in these areas unfeasible. The WHPA states that no person shall alter wildlife habitat and ecological lands unless the alteration is permitted in the regulations or authorized by the minister.

This desktop analysis correlated with results from field observations which determined that much of the undeveloped shoreline needs to be protected from development due to the lands being sensitive, having significant fish and wildlife habitats and wetlands that serve to maintain the health and wellbeing of the lake, or includes lands that surround inlets and outlets to the lake. It is recommended that the RV of Big Shell, RV of Echo Bay, and RM of Spiritwood collectively review municipal planning policies outlined in **Section 9.1 and 9.2** to implement additional development guidelines for shoreline and adjacent areas.

Figure 9: Current Lake Development and Land Use



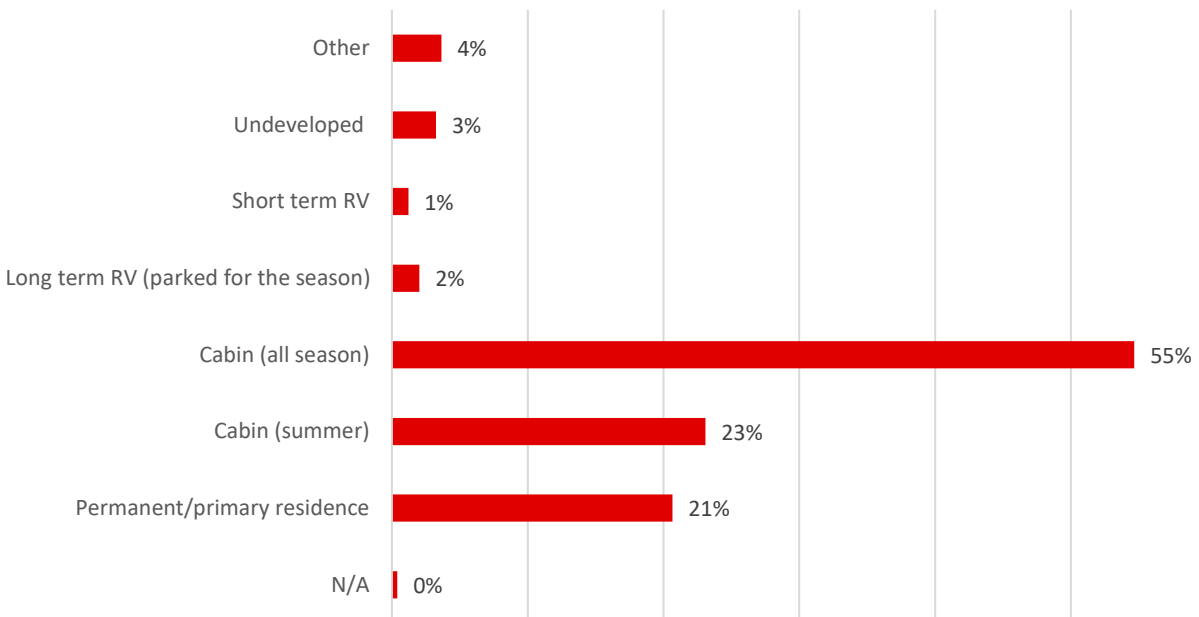
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5.3 PUBLIC ENGAGEMENT FEEDBACK REGARDING LAND USE AND DEVELOPMENT

The public engagement session on August 6, 2022, brought up concerns regarding land use and development surrounding Big Shell Lake. The common opinion from lake users is that the lake is at development capacity. Additionally, 163 survey respondents indicated concerns surrounding lake use and development. Many respondents feel that development has started to negatively effect the natural environment of the lake.

Survey responses provided important information regarding current residential development styles and occupation rates that help illustrate lake use trends. Ninety percent (90%) of survey respondents indicated they own a property at Big Shell Lake, with the remaining respondents either renting a cabin, renting a seasonal campsite, or being a day user of the lake. Many survey respondents indicated they have an all-season cabin (55%), summer season cabin (23%), or a permanent/primary residence at the lake (21%). The remaining 1% of respondents indicated that their land was either undeveloped or is a garage/storage structure only (**Figure 10**).

Figure 10: Development Types

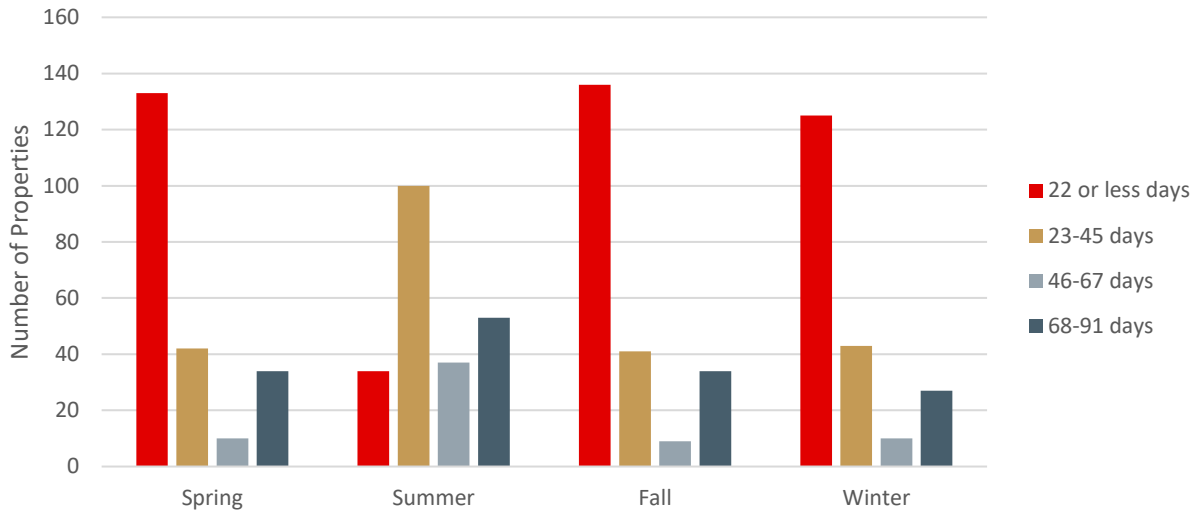


Of the respondents that indicated they have a cabin or permanent residence, 66% indicated those dwellings were built over 20 years ago and most dwellings fell between 1,000 and 1,500 ft² with 3-4 bedrooms and 1-2 washrooms, illustrating some trends around age and size of dwellings at the lake.

The survey also gathered data on occupancy trends, which in turn impact lake use levels. The majority of respondents indicated that on average 2-4 individuals stay at their property at one time (**Figure 11**). As expected, summer is the time of year where occupancy is highest with 100 survey respondents indicating their property is occupied 23-45 days of the season. Spring, fall, and winter are much less busy with the majority of properties being occupied 22 or less days during those seasons. It is important

to note that the public survey captured a portion of the full lake population, so these trends represent only respondents' occupancy.

Figure 11: Property Occupancy Trends



Survey respondents indicated specific concerns regarding lakefront development. Survey respondents commented that when lakefront development occurs, new building materials are brought in and natural vegetation is removed, severely altering the natural shoreline, and destroying the natural habitat of many native species. Survey respondents also noted that there has been significant habitat destruction surrounding Big Shell Lake for the purpose of developing new residential lots.

6.0 INFRASTRUCTURE

6.1 WATER SUPPLY

Water servicing is not provided to residential properties surrounding Big Shell Lake. Property owners are responsible for their own water supply. Public survey respondents indicated their properties are either serviced by a private well (60%), they have a holding tank (20%) or they draw water from the lake (20%). Public survey respondents indicated that they also haul water for drinking and collect rainwater for other uses.

6.2 WASTEWATER

Most residential properties surrounding the lake have septic tanks that are pumped out and hauled to a nearby lagoon. Septic haulers identified in the area include Neilson Septic and Morris Septic. In some cases, a jet and mound system is used for wastewater management. Jet and mound systems are typically used at farmsteads, while most lakefront properties utilize septic tanks.

There are two known lagoons within the Big Shell Lake area. There is an evaporative lagoon owned by the RM which services residential areas including Aspen Ridge and Sunset Rim. The lagoon has a capacity to serve 100 lots. Capacity of this lagoon would be a concern if future development were to be considered. The RV of Echo Bay also has a lagoon that serves properties within the RV of Echo Bay, RV of Big Shell, Pebble Bay, and Iroquois Lake.

6.3 STORMWATER INFRASTRUCTURE

The area around Big Shell Lake utilizes surface drainage through culverts, open channel ditches, as well as natural drainage patterns. No berms are present around the lake.

Within the RV of Big Shell there are few areas that are susceptible to flooding and have further drainage concerns. When water levels are high, the following highlighted areas of Loon Road are susceptible to flooding (**Figure 12**).

Figure 12: RV of Big Shell Flood Prone Area #1



Figure 13 represents a low-lying area within the RV of Big Shell. The blue line represents a culvert that will back up and cause flooding around the areas. Installing large diameter culverts at locations known to be susceptible to flooding is something the RV of Big Shell may consider.

Figure 13: RV of Big Shell Flood Prone Area #2



6.4 ROADS

Between the RM of Spiritwood, the RV of Big Shell, and the RV of Echo Bay, hundreds of miles of gravel road are maintained. Each Municipality is responsible for maintaining their own roads. No upcoming major upgrades are planned. Regular maintenance is the primary focus of the RVs and RM.

6.5 SOLID WASTE MANAGEMENT

There are several solid waste providers serving Big Shell Lake. Solid waste bins are located within the RVs. Residents are responsible for bringing their own waste to the centralized bins. The RV of Big Shell and the RV of Echo Bay's solid waste is serviced by Highway 55 management. Their solid waste facility is located within the Village of Canwood. The RM of Spiritwood solid waste management is provided by Loraas, TJ Disposals, and Greenland Waste.

7.0 CARRYING CAPACITY

The concept of carrying capacity is founded in the biological sciences and is defined generally as “the population of organisms that can be sustained considering the resources available in the ecosystem in which they reside.” This concept was further applied to terrestrial recreation resource management in areas such as national parks and campgrounds as well as to aquatic environments such as lakes. Recreational carrying capacity is defined as “the amount of development and activity a body of water can handle before it starts to deteriorate.” Determining the optimum use level for a lake is a complex process, which varies from lake to lake and according to the perceptions of users.

The traditional concept of carrying capacity did not consider user perception or user values. Therefore, carrying capacity should include an element of perception or values from area users and managers, who add the human component to carrying capacity (Shelby, Shelby, & Heberlein, 1986).

As a result of user perception, carrying capacity determination is never purely objective (Bosley, 2005). Most carrying capacity conflicts do not revolve around resource questions, but more so around questions of values. In other words, time and effort are spent on collecting data about the physical environment when the conflict is essentially human-based and is unlikely to be resolved by biological information. Therefore, it is important to break the concept of carrying capacity into two parts: the resource component and the values-based component. It is important to note that the idea of “optimum” carrying capacity revolves around the question of values, which are usually determined through a census of users and are articulated in management objectives. This is beyond the scope of this study.

For the purposes of this study, the carrying capacity of Big Shell Lake has been defined based on the measures of environmental change/conditions (biophysical/ecological characteristics of Big Shell Lake including the fisheries resources and water quality). However, efforts were taken to understand boat usage and capacity as part of this study, as this constitutes recreational carrying capacity in its simplest form.

7.1 BOAT USAGE AND CAPACITY

To gather current data on boating behaviours and usage on the lake, a two-step process was developed to learn more about the total number of inactive boats (static count) and active boats (peak counts). The boat count was conducted on Saturday, July 1, 2023. This date was selected as it was expected lake use would be high on the long weekend if weather was favourable. During the data collection, a total of four boat launches were noted surrounding the lake (one each at the RV of Echo Bay, RV of Big Shell, Aspen Ridge Estates, and northeast of Sunset Rim Estates).

These observations only reflect boat usage as a snapshot in time rather than a total boat count of all boat usage throughout the summer season. These methodologies may not provide an accurate portrayal of boat numbers that lake users may experience; however, the boat count survey process was adapted with the guidelines established by the Ontario Ministry of Natural Resources for boat capacity analysis. The data collected from the boat count is supplemented and enhanced by the community engagement survey results to provide context for lake user experience around boat use.

7.1.1 STATIC BOAT COUNT

Starting at 6:12 am, the static boat count was conducted by operating an Insta 360 pro camera from a motorboat driven along the shoreline to capture boat type/location footage. The total number of boats parked at docks along the shoreline and boats parked on land (on private property or in public storage areas) were recorded and separated into the categories of motorboat, pontoon boat, and sea-doo's (**Table 8**). In total, 270 boats were docked on the lake, the majority of which were motorboats and pontoon boats located on the shorelines of the RV of Echo Bay and RV of Big Shell. An additional 49 boats were stored offshore on private property and in public storage areas. One limitation of this data point is that only boats that were observable from the road were counted. Any boats parked in garages or obstructed areas were not included in this data.

Table 8: Static Morning Boat Count

	DOCKED BOATS			BOATS PARKED ON LAND		
	Motorboat	Pontoon	Sea-doo	Motorboat	Pontoon	Sea-doo
Resort Village of Echo Bay	66	44	16	16	0	3
Resort Village of Big Shell	58	22	9	20	4	0
Aspen Ridge Estates	15	8	5	3	1	0
Sunset Rim Estates	4	4	0	3	0	0
Misty Grove	13	4	2	0	0	0
Total	156	82	32	42	4	3
Total Docked Boats	270			-		
Total Boats Parked on Land	-			49		
Total Boats	319					

During the morning count, there were a total of seven boats active on the water (**Table 9**). These active boats were not separated into locations due to the small quantity and accounting for freedom of movement.

Table 9: Active Morning Boat Count

BOAT CATEGORY	ACTIVE BOATS
Motorboat	4
Pontoon	3
Sea-doo	0
Total	7

7.1.2 PEAK BOAT COUNT

The peak boat count started at approximately 1:10 pm. The process of recording boats replicated the morning count with the addition of an extra trip around the dense boat locations of the lake to capture active numbers on the water. In the afternoon a second count of boats parked on land was not conducted. In total, 197 static boats were counted in the afternoon, the majority of which were parked on the shores of the RV of Echo Bay and RV of Big Shell (**Table 10**).

Table 10: Static Afternoon Boat Count

DOCKED BOATS				
	Motorboat	Pontoon	Sea-doo	Total
Resort Village of Echo Bay	52	26	16	94
Resort Village of Big Shell	40	11	7	58
Aspen Ridge Estates	13	3	5	21
Sunset Rim Estates	4	2	0	6
Misty Grove	9	4	5	18
Total	118	46	33	197

The active afternoon count observed high densities of boats in 4 different areas. On the count day there was an annual Canada Day boat parade happening in Echo Bay which resulted in a high traffic zone. There was another cluster of boat activity along the undeveloped shoreline south of Misty Grove and west of Echo Bay along the recreational site boundaries. Another heavily utilized area was the shoreline along the west side of the lake near the Wildlife Habitat Protection zone due to the sandy beach there and having good protection from northwest winds. Lastly, it was observed that the center of the lake was where most boats congregated for water sports activities. In total, 88 boats were active during the afternoon count, 81 of those were motorized boats creating significant wakes (**Table 11**).

Table 11: Active Afternoon Boat Count

BOAT CATEGORY	ACTIVE BOATS
Motorboat	41
Pontoon	40
Sea-doo	7
Total	88

Totalling docked and active boats, 285 boats were counted in the afternoon which is significant to lake capacity because all boats present have the potential to be used for recreational purposes on the lake and be set in motion at any time. Of the total 285 boats present at the lake, 86% were motorized boats (ski, wake, and pontoon boats) which create large wakes and the remaining 14% of the boats were sea-doo's which create smaller wakes. This data indicates that most boats are larger motorboats which consume more space on the lake and produce more intense wake activity.

Based on data collected during the boat count and qualitative observations of lake activity, boat use at peak times results in mid-to-heavy traffic on the lake. During the boat count, it was clear that active

boats had ample space to travel on the lake safely around other active boats. It is recommended that the RV of Big Shell, RV of Echo Bay, and RM of Spiritwood consider collectively developing lake use guidelines to implement 'Slow Zones', increase awareness of boating etiquette best practices, and awareness of environmentally sensitive areas as per **Section 9.3** to address concerns raised by lake users outlined in **Section 7.2**.

7.2 PUBLIC ENGAGEMENT FEEDBACK REGARDING BOAT ACTIVITY

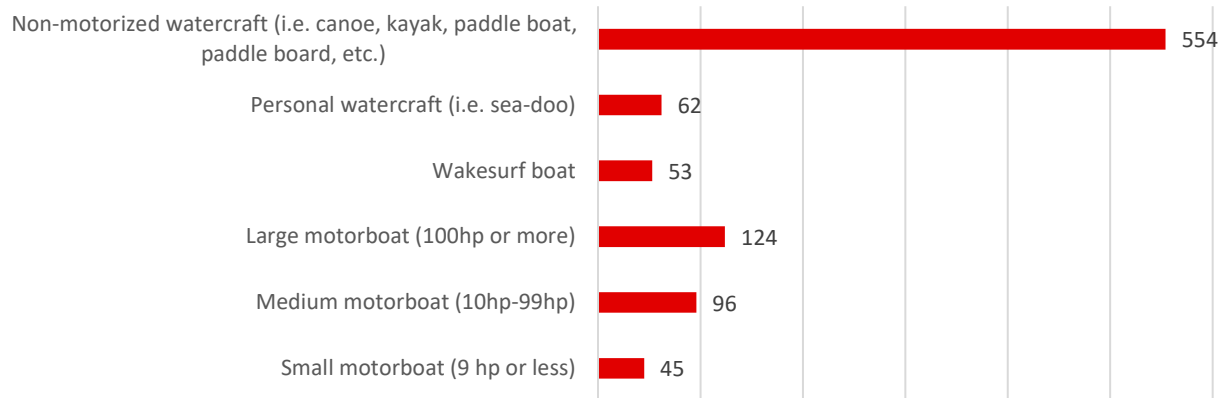
The most popular recreational activities that take place in Big Shell Lake revolve around the lake itself. Fishing, swimming, boating, beach activities, and ice fishing are what survey respondents identified as the recreational activities that their households are most involved in. However, many residents are concerned that their continued participation and enjoyment of these activities are at risk due to the increased boat traffic over the years. Boating is by far the most popular recreational activity with over 90% of Big Shell Lake survey respondents being active boat users. The top comment from the public regarding lake use is the high number of wake boats on the lake. According to survey feedback, the high number of wake boats contribute to shoreline erosion, poor water quality, and create dangerous lake conditions. Feedback from lake users state that because of increased boat traffic and boat driver behaviours, many do not go on the lake at certain times because they feel it is unsafe. Survey respondents indicated that many boat drivers do not drive safely or show respect for the lake and other users. This includes driving too close to the shoreline, driving too close to smaller boats, playing loud music, and throwing garbage into the lake. Lake users expressed during the public engagement day that they believe the lake is at capacity when it comes to the number of boats.

Furthermore, public engagement feedback indicated that many lake users are not property owners. This means that a percentage of lake users do not reside within the area and are coming from elsewhere to use the lake and its facilities. i.e., boat launch. About 83% of survey respondents have a private dock or boat lift associated with their property.

Over time there has been growing concern about boating activity and its impact on Big Shell's natural environment. The public survey gathered information regarding the number of boats owned by survey respondents. Out of the 249 respondents, 234 respondents left information regarding personal boats. **Figure 14** provides a breakdown of the total boats owned by survey respondents. It is important to note that not everyone who uses a boat on the lake provided a response to the survey, so this data is not conclusive of the entire population.

Based on public survey responses and site visits to the lake, it is understood that many lake users have a private dock and/or boat lift that is associated with their property. Lake users have a variety of motorized watercrafts including motorboats, wake boats, and sea-doo's. Of those that responded to the public survey, there are at least 380 motorized boats associated with 234 survey respondents' properties. Survey respondents also indicated they use a variety of non-motorized watercraft including canoes, kayaks, paddle boats, etc. which totalled 554 non-motorized watercraft according to survey results.

Figure 14: Total Watercrafts Reported by Survey Respondents



8.0 ENVIRONMENTAL REGULATIONS

Environmental regulations and laws in Canada go as far back as 1857 when the Fisheries Act was originally introduced and is still in place today. Over the last two decades more stringent and defined laws, regulations and guidelines around protecting the environment have been implemented. All levels of government (municipal, provincial, and federal) play a critical role in establishing legislation and policy to preserve and protect the natural environment.

Development of any scale may trigger a range of environmental acts, approvals, permits, and guidelines. Several provincial and federal environmental regulations may be triggered of a proposed development or project. **Table 12** provides a list of relevant Acts and regulations in addition to Municipal policy that may require a review or approval of a proposed development project.

Table 12: Environmental Regulations Overview

LEGISLATION	DESCRIPTION	APPLICATION
<i>PROVINCIAL LEGISLATION</i>		
The Water Security Act	Provides the provinces mandate to manage and protect surface water and groundwater resources, features, and related lands.	Works around watercourses, waterbodies, and areas where groundwater could be affected.
The Environmental Assessment Act	Outlines the responsibilities of proponents of a development to conduct and submit Environmental Impact Assessments (EIAs) and Environmental Impact Statements (EISs) to the Minister of Environment.	The development of natural lands.
Environmental Management and Protection Act, 2010	Provides for the protection of air, land, and water against potentially harmful substances or activities.	The presence of wildlife habitat, wetlands, natural drainages, watercourses, soils, and native vegetation.
Wildlife Act and Regulations	Provides for the protection of wildlife and provincially listed species at risk.	The presence of wildlife and species at risk in proximity to the study area.

LEGISLATION	DESCRIPTION	APPLICATION
The Heritage Property Act	Provides for the preservation and development of heritage properties.	The potential presence of historic resources within the study area.
Saskatchewan Wetland Policy	Policy for the protection of wetlands.	The presence of wetlands within the study area.
Pest Control Act	Regulations that declare the animals, insects, or diseases designated as pests, and the responsibilities for their prevention, control, or destruction.	Historical and/or field records for clubroot and other invasive species.
The Weed Control Act	Regulations surrounding the designation, responsibilities, and control of plant species listed as prohibited, noxious, or nuisance weeds.	Works, activities, or travel with the potential to interact with and spread prohibited, noxious, or nuisance weeds.
The Planning and Development Act, 2007	Provincial legislation governing municipal authority pertaining to land use and development	Land use and development considerations are governed through this legislation authorizing municipalities the ability to prepare local policies and bylaws to manage land use and development within their boundaries
Statements of Provincial Interest (SPI's)	Identify provincial interests to guide provincial and municipal planning decisions, facilitating orderly development that strengthens economical, environmental, social, and cultural sustainability.	Provincial oversight to ensure consistency with the <i>Statements of Provincial Interest</i> occurs through the approval of new official community plans, district plans, zoning bylaws, and subdivision bylaws.
FEDERAL LEGISLATION		
Species at Risk Act (SARA)	Provides for the protection and conservation of species at risk in Canada.	Disturbance or destruction of a species at risk, its active residence, or its critical habitat.

LEGISLATION	DESCRIPTION	APPLICATION
Migratory Birds Convention Act	Provides for the protection of migratory birds, their nests, or their habitats.	Development within areas of suitable nesting habitat during the regional migratory bird nesting period (i.e. April 20 to August 25).
Fisheries Act	The Federal Fisheries Act provides for the management of fisheries and protection of fish and fish habitat, including pollution prevention and fish passage protection.	The potential for fish in wetlands and watercourses.
Canadian Navigable Waters Act	Administered through Transport Canada and helps to keep navigable waters open for transport and recreation	Any works or development interfering or affect navigation
Canadian Impact Assessment Act	Assesses the impacts of major projects carried out on federal lands or outside Canada	A planning and decision-making tool used to assess environmental, economic, health, and social effects of proposed projects. Assesses impacts to Indigenous groups and their rights
Federal Policy on Wetland Conservation	To promote the conservation of Canada's wetlands to sustain their ecological and socio-economic functions	Impacts or removal of wetlands on Federal lands

For any development or project that has potential to impact fish bearing waterbodies temporarily or permanently, this will trigger a review and require compliance with the Fisheries Act and may require an approval to complete the work. Any proposed development surrounding Big Shell Lake should provide confirmation that the Fisheries Act has been consulted and provide a copy of the approval in the form of a Letter of Advice or an Authorization.

Under the Migratory Birds Convention Act (MBCA) incidental take (i.e., the disturbance/death of migratory birds, their eggs, or nests) is a federal offence. As previously noted, Big Shell Lake is located in the B5 Nesting Zone of Canada, with a regional migratory nesting period of April 20 to August 25 (Government of Canada, 2018). Vegetation clearing and/or construction outside of the regional migratory bird period is recommended (i.e., prior to April 20 or after August 25). Construction, demolition, or vegetation removal within this period has a greater chance for contravention of the MBCA. Nest sweeps prior to any vegetation removal or prolonged noise disturbance during the nesting period should be conducted by a qualified professional to ensure compliance with MBCA and the Saskatchewan Wildlife Act.

9.0 WATERFRONT COMMUNITY DEVELOPMENT GUIDELINES

The objective of these guidelines is to ensure adequate ecological assessment, mitigation planning, and community planning is conducted before development to ensure responsible development takes place. Policy developed under these guidelines will help to ensure that lake resources within the study area will be available for the use and enjoyment of future generations.

This can be achieved through carefully planned development and construction mitigation policies. The guidelines should be viewed as a baseline standard that ensure responsible development to protect the lake, water quality, and the preservation of natural assets.

These guidelines can be applied to any lands within the study area. They are intended to ensure that development within the study area aligns with typical best management practices, as well as provincial and federal policy. They are not intended to conflict with existing provincial or federal policy recommendations. Where this may occur, the guidelines should be superseded.

The guidelines are not intended to be development and land use change roadblocks, but rather checkpoints to help communities meet policy and conservation objectives. Development proponents should demonstrate that policy objectives will be achieved through appropriate mitigation measures and adequate planning by qualified professionals.

The lake is a product of a larger systems within the watershed. Groundwater springs, ephemeral watercourses, creeks, and lakes that are hydraulically connected to the lake and contribute to water quality and habitat value of the region. The guidelines are easily transferable and can help guide policy decisions applied to watercourse and wetland areas outside of the study area.

9.1 PLANNING POLICY

Based on the review of current planning documents and public engagement feedback, it is recommended that the RM of Spiritwood review the following policies:

Agricultural Residential Development (RM of Spiritwood Zoning Bylaw 1-84 - Part VI Section 1)

A large percentage of undeveloped lakeshore land is zoned under the Agricultural Residential (AR) District. It is important that additional measures are in place to ensure future development is carefully considered and all factors of development are addressed. It is recommended that additional policies be considered for the AR district such as:

- Increased distance of development setbacks for lakeshore sites.
- Buffer agricultural activities or uses to decrease shoreline impact.
- Including remaining undeveloped AR District land adjacent to the lake under environmentally protected lands to mitigate environmental disturbances and continued shoreline development.
- Requirements for site plans to include location of existing vegetation to be retained and the proposed future land scaping.

Within the AR district, the land use that has the highest potential to impact lake use is the discretionary use of *d) Recreational, including sports fields, golf courses, tourist campsites parks and other similar uses.*

It is recommended that additional policies be considered for this use such as requirements for:

Tourists' campsites parks and other similar uses:

- Limits to number of sites.
- Site size specifications.
- Site setback specifications.
- Site servicing.
- Limits to expanding existing campgrounds.
- Assessing projected campground population and potential impact to infrastructure and lake use.
- Responsibility for costs associated with providing required new or upgraded municipal services and/or roads necessary to support increased population and use.

Lakeshore Development (RM of Spiritwood Zoning Bylaw 1-84 - Part VI Section 6)

As stated in the RM of Spiritwood Zoning Bylaw, the intent of the Lakeshore Development district is to control the standards of development for lakeshore development uses in approved locations. These lands are limited to residential and recreation development. Including single family dwellings, mobile homes, picnic grounds, golf courses, sports fields, public beaches, and parks. As these lands are environmentally sensitive, an important next step is outlining an environmental assessment process for permitted and discretionary development applications. This will help inform applicants of the types of surveys and considerations that should be conducted as part of the early planning stages. This document provides recommendations for pre-development site assessment surveys, and identify potential impacts, general mitigation measures, and other development considerations.

Within the RM of Spiritwood Zoning Bylaw, tourists' campgrounds for rental to tourists on a seasonal basis is listed as a "Use Permitted at Councils Discretion." Within the Lakeshore Development District, this use has the highest potential to impact lake user population. As such, it is recommended that if such a use is to be considered, Council may wish to limit the number of camp sites or impose other policies to limit impact on the lake in alignment with the recommendations for the Agricultural Residential Development Zone.

Hamlet Areas (RM of Spiritwood and Village of Leoville District Plan, Section 4.6)

Some of the Lakeshore Estates mentioned in the District Plan are directly adjacent to Big Shell Lake, including Aspen Ridge and Misty Grove. Within the District Plan, these developments fall under the Hamlet Area. Sunset Rim is another Lakeshore Estate within the RM of Spiritwood that is adjacent to Big Shell Lake, however it is not mentioned as being a Hamlet Area. As stated in the bylaws, the objective of the Hamlet Area is to "promote and strengthen each Hamlet as an asset to the district as an alternative residential option." General policy 4.6.1 of the District Plan states that the growth of the existing Hamlets will be encouraged and general policy 4.6.2 states that the infilling of vacant lots within the hamlets shall be encouraged to promote efficient use of space and accommodate new development.

The Hamlet areas encourage additional residential, commercial, and industrial development. It is recommended that the lake front developments such as Aspen Ridge and Misty Grove be considered "Lakeshore Development Areas" to align the development areas with policies relating to the protection

of the natural environment, promoting sustainable development, and encouraging environmentally respectful residential and lakeshore development in proximity to the lake.

9.2 PRE-DEVELOPMENT SITE ASSESSMENTS

Any new development around the lake will contribute to the cumulative impacts and loss of sensitive ecological areas. Striking a balance between responsible development and retaining sensitive habitats can be addressed with a comprehensive environmental assessment of the lands that are proposed for development or redevelopment.

Creating an environmental assessment framework or policy that outlines the requirements to complete an environmental assessment will help to standardize the assessment and review process. A standardized process will provide proponents with an understanding of what is expected and required to complete the land development application process. This will provide a consistent approach to reviewing detailed data and information with a clear understanding of the current environmental conditions, to make informed decisions of the proposed development that will be in the best interest of the lake and surrounding communities.

These assessments will provide an ecological inventory, identify impacts, mitigation measures and address cumulative effects of what is being retained and lost. Proponents should complete the assessment during appropriate times of the year (the growing season) and confirm that ecological losses associated with the proposed development are in the best interest of the lake and the community. Significant loss of valued ecological components may be the deciding factor for council to reject the proposed development before further studies are completed.

To support and build upon current policies, the following recommendations are provided for the collection of information, and data that can be applied to understanding the impacts and cumulative effects of development.

Land development proposals require special consideration from the earliest stages of planning to anticipate and minimize the impacts of development during construction and over the life of the development.

1. For the protection of the waterbodies and their natural assets refer to setback requirements and establish the legal boundary and setback requirements of waterbodies and their tributaries according to existing provincial policy. Consider setting riparian area setbacks for the study area if no binding setback requirements exist.
2. Before development approval have the subject lands assessed by a qualified professional for biophysical characteristics to identify high-value natural assets that may require avoidance or special consideration. This includes specific studies such as vegetation, wildlife habitat, fish spawning and rearing areas, soils and geotechnical investigations for determining risks and impacts to slope stability and groundwater influence.
3. Encourage the protection of riparian zones to maximize natural assets, maintain stability, manage runoff and nutrient retention.
4. Depending on the previous land use of a proposed development site, existing contamination may be a concern. Conducting a Phase I Environmental Site Assessment following the Canadian Standards Association guidelines is recommended to limit the liability associated with disturbing, moving, or inheriting responsibility for existing contamination. This will help to identify mitigate the spread of pollution from disturbing outdated building materials such as asbestos, or contaminated soils from historical land use such as fuel storage and service stations.

5. Conduct a stormwater management assessment to understand the amount of stormwater that will be generated post development. Identify stormwater management designs that address treatment, storage and release.
6. Prior to development assess the area for historical resources.
7. To accurately characterize a landscape and identify potential sensitive species and habitat site surveys need to be conducted during specific times of the year. Examples include wildlife surveys, (breeding bird surveys May/June/July) rare plant (early - May and late season -Aug surveys).

9.3 LAKE USE

Shoreline erosion and sedimentation effects can be greatly accelerated by boat use and other human activities on the lake. Water movement caused by large wakes and high-speed boating create sediment movement and shoreline erosion, which can alter and disturb the natural functions of the lake.

Based on the findings associated with the boat count and public engagement feedback, it is recommended that guidelines be introduced to communicate lake use best practices to promote lake health and improve overall boat safety. For consideration, the project stakeholders could introduce:

- Signage/maps posted at public boat launches, online, or as handouts that communicate information such as:
 - 'Slow zones' which would limit boat speed to 10 km/h within 100 ft of the shoreline (Transport Canada Shore-line Speed Restriction) to protected habitat areas, swimming areas, and reduce shoreline erosion;
 - Boating etiquette best practices; and
 - Environmental considerations and areas of sensitivity such as valued wildlife and fish habitats.
- Buoys/markers in the water to indicate areas where speed must be lowered for safety and lake health.

It is recommended that these actions be considered in partnership with the RVs of Big Shell and Echo Bay and the RM of Spiritwood to ensure consistent messaging and buy in from all lake users. Engagement with the Provincial Government is recommended to confirm what can be regulated for boat activity and how.

10.0 RECOMMENDATIONS

The following sections provide a range of high-level recommendations to support responsible development decision making. The recommendations can be used to address and reduce negative cumulative effects to the study area that result from development, re-development, social and recreational activities, and everyday uses. The impacts associated with new development, re-development, recreational activities, and natural events all contribute to cumulative impacts of the lake, lakeshore, and beyond. **Table 13** provides recommendations to promote a balance of environmental conservation and sustainable development.

Table 13: Recommendations Overview

COMPONENT	TARGETED ACTION
<p>Legislation and Management</p>	<p>Review planning policies for Agricultural Residential Development, Lakeshore Development, Hamlet Areas, and Country Residential Development as per Section 9.1.</p> <p>Establish criteria or policy for setback requirements from any waterbody, using a scientific approach based on soils, vegetation, slopes, and geotechnical. For an example see Stepping Back from the Water: a Beneficial Management Practices Guide for New Development Near Waterbodies in Alberta’s Settled Region (2012).</p> <p>Consider implementing additional requirements for pre-development site assessments as per Section 9.2.</p> <p>Establish standards for surveying and reporting on ecological conditions prior to development activity (i.e. Ecological Impact Assessment).</p> <p>Consider limiting vegetation clearing and/or construction activities to take place outside the regional migratory bird period (i.e., prior to April 20 or after August 25).</p> <p>Establish policy to ensure the conservation of remaining wetlands as they influence and benefit the health of the lake.</p> <p>Establish policies to limit changes to undeveloped shoreline areas to protect sensitive ecological areas including fish and wildlife habitats.</p> <p>Consider installing large diameter culverts at locations known to be susceptible to flooding (RV of Big Shell).</p>
<p>Education</p>	<p>RV of Big Shell, RV of Echo Bay, and RM of Spiritwood should commit collectively to delivering consistent lake use and conservation information to property owners and other lake users.</p> <p>Develop best practices and educational materials for distribution to lake users that illustrate measures for conservation and preservation of the</p>

COMPONENT	TARGETED ACTION
	<p>natural environment that can be applied to existing developments and implemented by lake users.</p> <p>Highlight conservation areas around the lake to improve public understanding of the appropriate use of public lands.</p> <p>Consider collectively developing lake use guidelines to implement ‘Slow Zones’, increase awareness of boating etiquette best practices, and awareness of environmentally sensitive areas as per Section 9.3.</p> <p>Prepare a property owner’s manual that promotes awareness and provides advice and support on how environmentally responsible maintenance of property can contribute to ecological and lake health.</p> <p>Utilize funding sources for education programs through Provincial and Federal funding.</p>
Monitoring/Compliance	<p>Annually conduct an evaluation of local development policies, guidelines and permits.</p> <p>Prepare guidelines to promote annual inspections on infrastructure (Lagoon, waste transfer station, etc.).</p> <p>Undertake site inspections at the final acceptance of development i.e. vegetation re-establishment, setbacks, and as built surveys.</p> <p>Undertake site inspections during construction activities to ensure compliance of approvals and environmental protection measures have been implemented, monitored, and maintained.</p> <p>Undertake additional water quality sampling to track if the lake is trending up or down in water quality and further investigate quality of water sources surrounding Big Shell Lake.</p> <p>Consider a municipal requirement for confirmation of other jurisdictional regulatory approvals (i.e.: Fisheries Act) as part of development permit and approvals process.</p>
Establishing Criteria and Baselines	<p>Develop an environmental framework plan or policy to set out terms of reference for a biophysical/ecological impact assessment with site specific surveys such as native and rare plant surveys, soil classification, wildlife and wetland classification, etc.</p> <p>Establish setback policy for waterbodies, wildlife corridors or other environmentally sensitive areas, and areas of potential or known contamination.</p>

COMPONENT	TARGETED ACTION
<p>Design Considerations</p>	<p>Create updated density regulations to limit the number of lots that can be developed within the Lakeshore Development District and Residential District.</p> <p>Ensure development density and site coverage is compatible with the physical capabilities of the shoreland and water body.</p> <p>Allow for conservation of publicly accessible waterfront.</p> <p>Avoid the use of retaining walls below the high-water mark and require more natural landscape features including rocks and plantings set into a stable slope.</p>

12.0 LIMITATIONS

The study was conducted over one year, which limits the amount of data and information that can be collected and any emerging trends. The following are some limitations of this short-term assessment:

- Water quality – a reoccurring study over multiple years and consistent parameters would support clearly outlined objectives and trends in water quality.
- Algal blooms were not tested and or studied as these efforts fell outside of the project scope.
- Habitat assessment was not a detailed assessment of each eco-site or developed areas and does not provide site specific habitat information. It was conducted to gain an understanding of the areas undeveloped verses developed and to observe adjacent land uses.
- Assessing or identifying climate change was not included as part of the scope for this study.
- Boat capacity survey provided a snapshot in time as it was only completed once over the course of the summer.

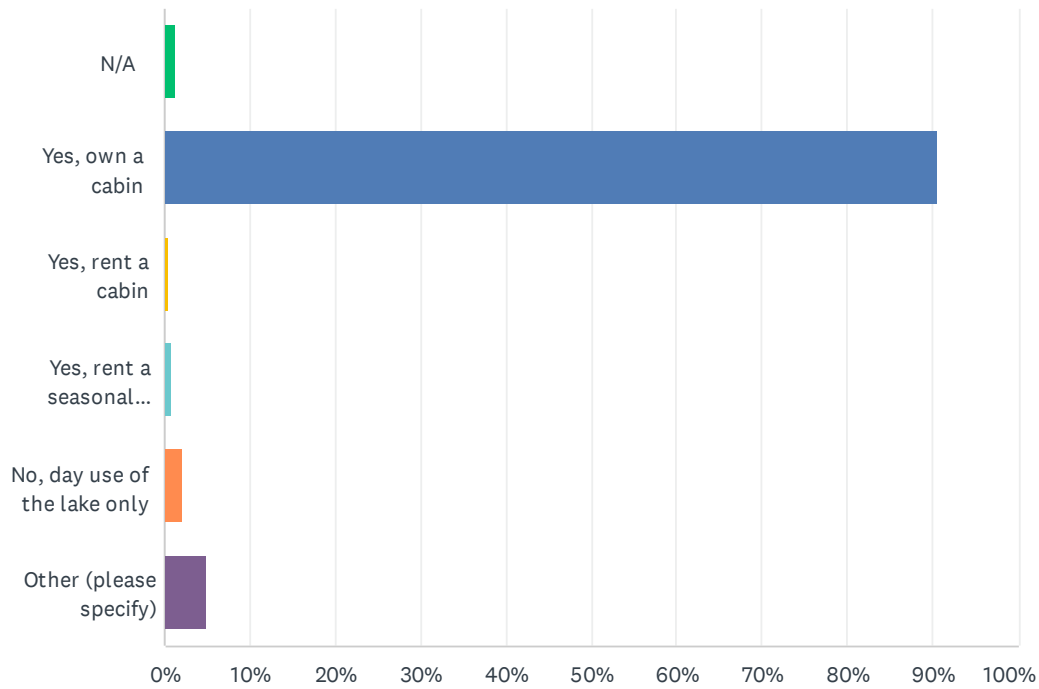


APPENDIX A

Public Survey Responses

Q1 1. Do you own or rent a property at Big Shell Lake?

Answered: 246 Skipped: 3



ANSWER CHOICES	RESPONSES
N/A	1.22% 3
Yes, own a cabin	90.65% 223
Yes, rent a cabin	0.41% 1
Yes, rent a seasonal camping site	0.81% 2
No, day use of the lake only	2.03% 5
Other (please specify)	4.88% 12
TOTAL	246

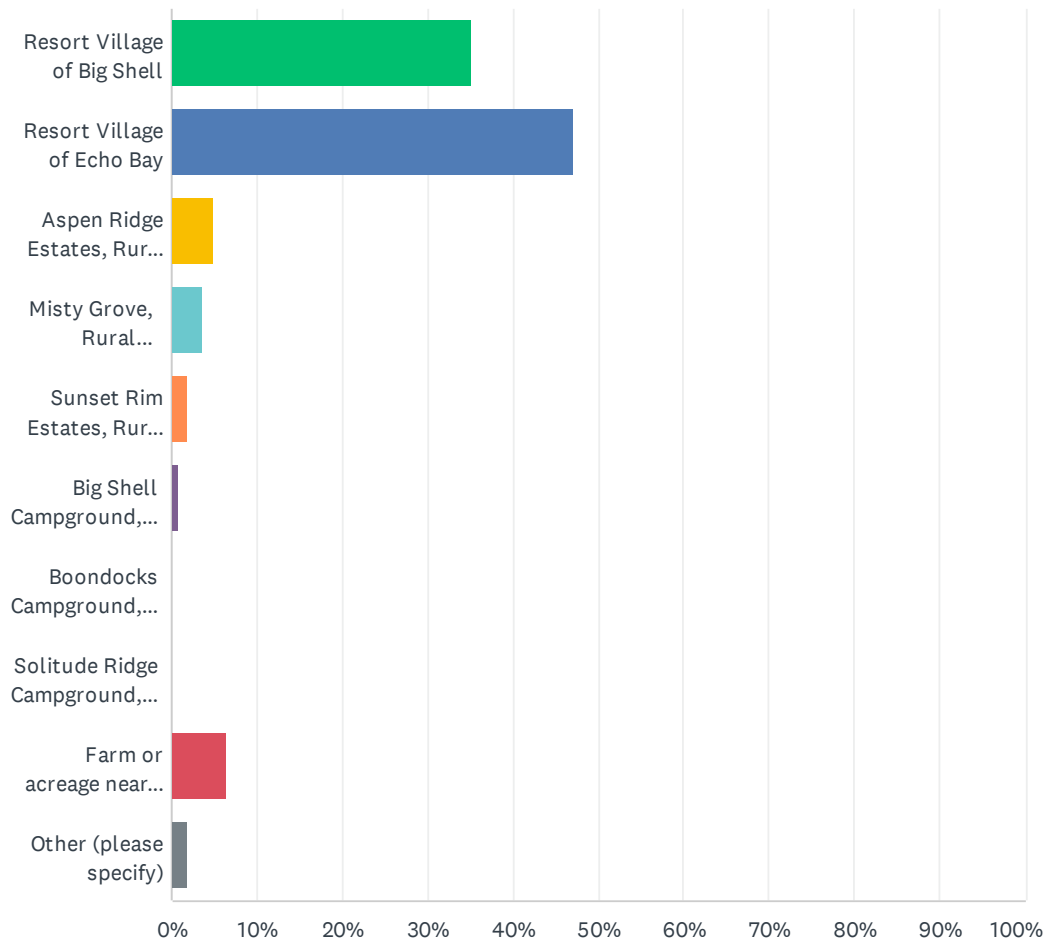
#	OTHER (PLEASE SPECIFY)	DATE
1	Parents own cabin	8/31/2022 7:33 PM
2	Live yearly access lake all the time	8/30/2022 3:24 PM
3	Own property and live year round at the lake	8/27/2022 4:28 PM
4	Own an empty lakefront lot	8/26/2022 2:50 PM
5	Own farmland adjacent to lake and river	8/23/2022 2:53 PM
6	Empty Loat	8/22/2022 4:44 PM
7	Acreage not on lake	8/17/2022 1:58 PM
8	Lease land that borders lake	8/16/2022 9:31 PM

Big Shell Lake Capacity Study Survey

9	Own land adjacent to RVBS	8/16/2022 3:04 PM
10	We have a family cabin that we use regularly	8/10/2022 5:06 PM
11	Have active building permit to build soon	8/7/2022 9:34 AM
12	Parents own a cabin at Big Shell	8/2/2022 9:09 AM

Q2 2. Where is your property located at Big Shell Lake?

Answered: 248 Skipped: 1



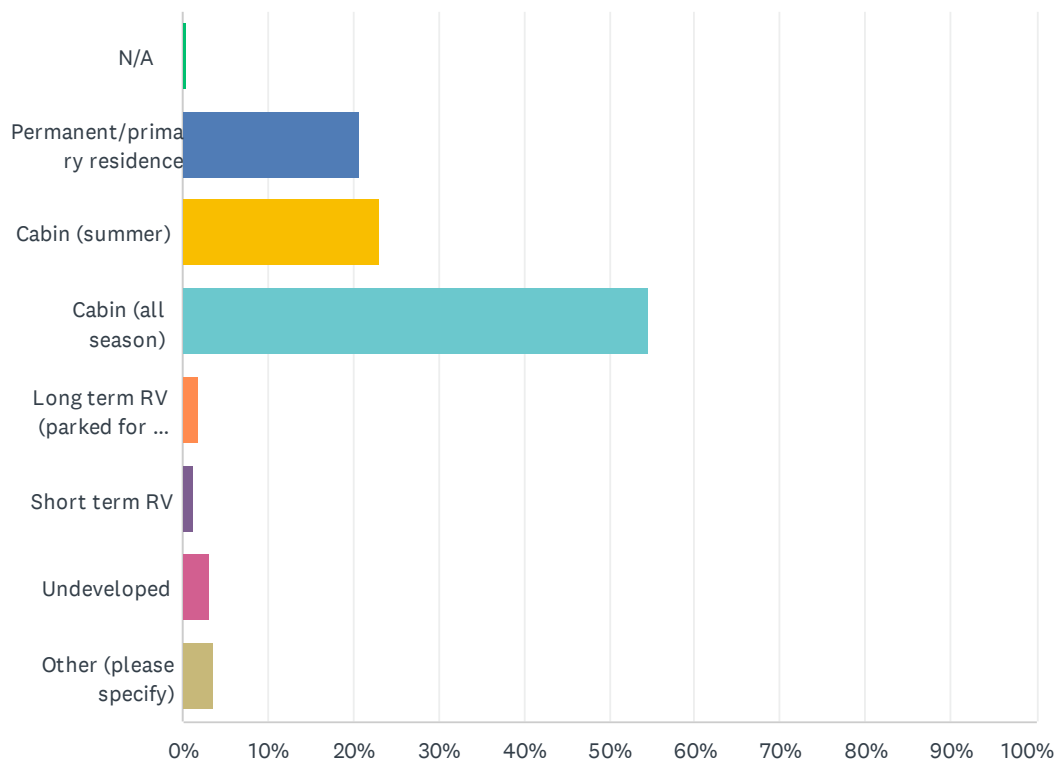
Big Shell Lake Capacity Study Survey

ANSWER CHOICES	RESPONSES	
Resort Village of Big Shell	35.08%	87
Resort Village of Echo Bay	47.18%	117
Aspen Ridge Estates, Rural Municipality of Spiritwood No. 496	4.84%	12
Misty Grove, Rural Municipality of Spiritwood No. 496	3.63%	9
Sunset Rim Estates, Rural Municipality of Spiritwood No. 496	2.02%	5
Big Shell Campground, Rural Municipality of Spiritwood No. 496	0.81%	2
Boondocks Campground, Rural Municipality of Meeting Lake No. 466	0.00%	0
Solitude Ridge Campground, Rural Municipality of Spiritwood No. 496	0.00%	0
Farm or acreage near the lake	6.45%	16
Other (please specify)	2.02%	5
Total Respondents: 248		

#	OTHER (PLEASE SPECIFY)	DATE
1	Acreage on the lake	8/27/2022 4:28 PM
2	Farmland near Aspen Ridge	8/23/2022 2:53 PM
3	1 mile of shore line on west side of lake	8/16/2022 9:31 PM
4	Caswell Development	8/4/2022 3:32 PM
5	Private land on lakeshore	8/2/2022 10:41 PM

Q3 3. What types of development/dwellings exist at your property?

Answered: 247 Skipped: 2



ANSWER CHOICES	RESPONSES
N/A	0.40% 1
Permanent/primary residence	20.65% 51
Cabin (summer)	23.08% 57
Cabin (all season)	54.66% 135
Long term RV (parked for the season)	2.02% 5
Short term RV	1.21% 3
Undeveloped	3.24% 8
Other (please specify)	3.64% 9
Total Respondents: 247	

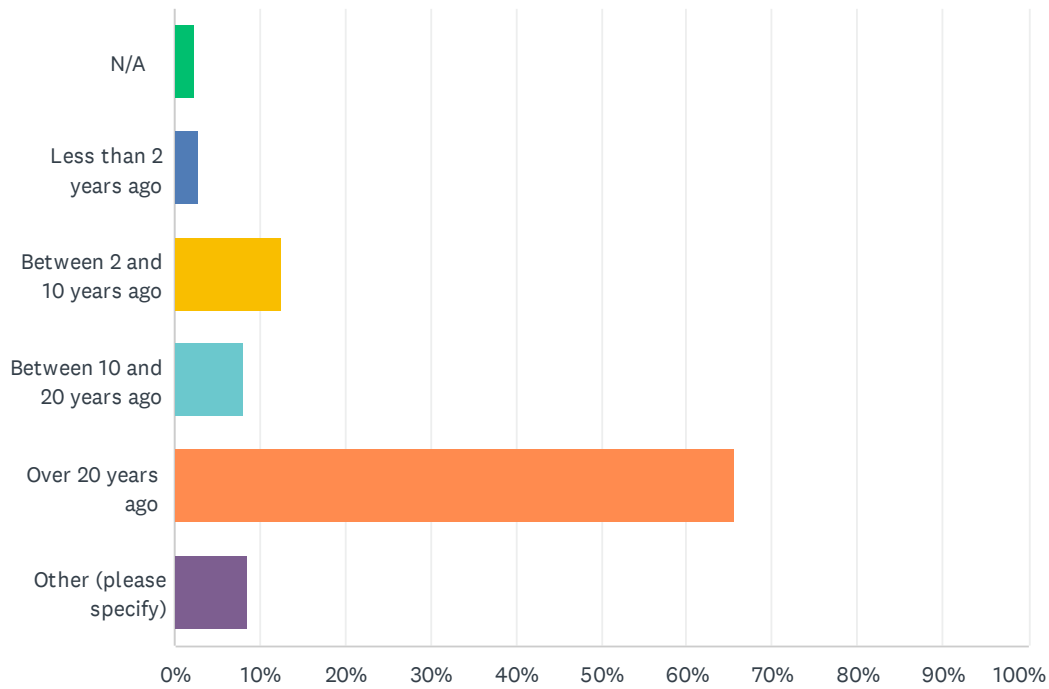
#	OTHER (PLEASE SPECIFY)	DATE
1	Garage	8/27/2022 11:19 AM
2	A small garage	8/26/2022 2:50 PM
3	No road access . Rd. Overgrown and not maintained by the Rm	8/24/2022 10:26 AM
4	Camping occasionally	8/17/2022 1:58 PM

Big Shell Lake Capacity Study Survey

5	mainly summer but sometimes winter	8/16/2022 5:15 PM
6	Pole barn is the only permanent structure over 100sq ft. We have a yurt on the property and store our camper there.	8/16/2022 3:04 PM
7	Bunkhouse	8/15/2022 1:09 PM
8	A garden shed	8/10/2022 5:06 PM
9	garage	8/8/2022 8:37 AM

Q4 4. When was the main dwelling developed on the property?

Answered: 248 Skipped: 1



ANSWER CHOICES	RESPONSES
N/A	2.42% 6
Less than 2 years ago	2.82% 7
Between 2 and 10 years ago	12.50% 31
Between 10 and 20 years ago	8.06% 20
Over 20 years ago	65.73% 163
Other (please specify)	8.47% 21
TOTAL	248

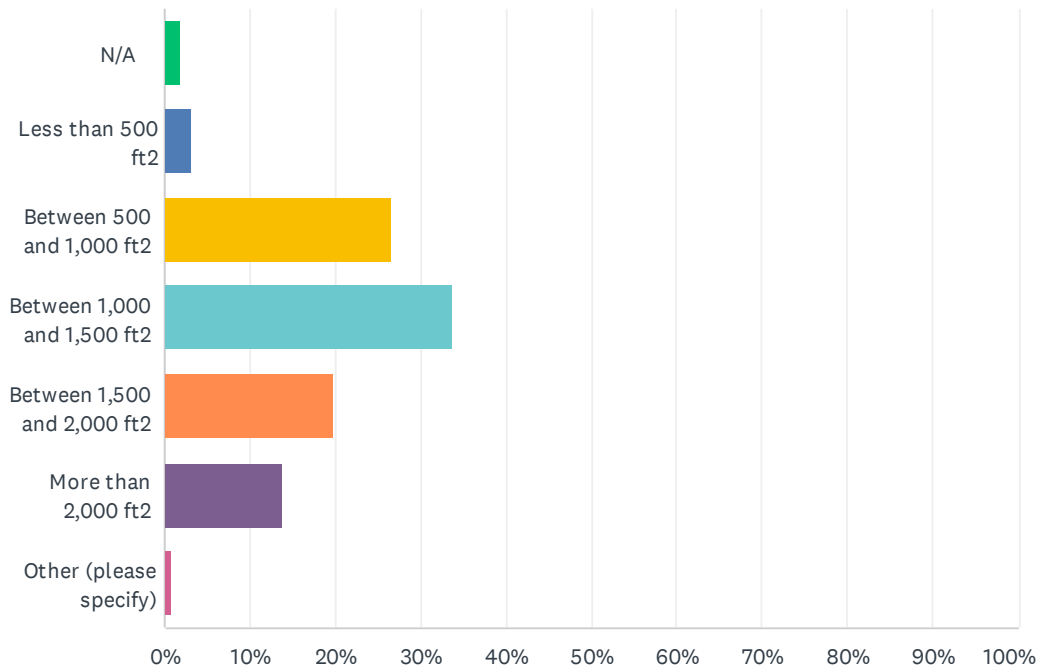
#	OTHER (PLEASE SPECIFY)	DATE
1	1983	8/27/2022 5:01 PM
2	42 years	8/27/2022 4:28 PM
3	42 years	8/26/2022 1:20 PM
4	1977	8/26/2022 12:43 PM
5	37 years ago	8/26/2022 12:32 PM
6	My dad's Homestead (everything burned to ground)	8/24/2022 10:26 AM
7	Over 30 years ago	8/23/2022 7:35 PM
8	Under construction	8/22/2022 2:01 PM

Big Shell Lake Capacity Study Survey

9	1942 and 1978	8/22/2022 9:39 AM
10	100 years plus	8/19/2022 6:15 AM
11	Cabin established in late 70's; replaced with permanent dwelling in 2007.	8/15/2022 7:43 AM
12	Original small 1988 cabin was replaced with current dwelling in 2017	8/12/2022 6:28 PM
13	1981	8/11/2022 9:37 AM
14	Original 1980s cabin was replaced in 2017 with current dwelling.	8/10/2022 6:17 PM
15	35 years ago	8/10/2022 2:16 PM
16	Old cabin of 20+ years replaced	8/8/2022 10:03 AM
17	1980	8/8/2022 9:53 AM
18	38 years	8/6/2022 4:27 PM
19	1980	8/4/2022 9:28 PM
20	Original was 1984, we purchased in 2002 when it became an all-season cabin and rebuilt for primary residence in 2018.	8/2/2022 9:50 PM
21	47 years ago	8/2/2022 9:22 AM

Q5 5. What is the square footage (ft2) of the main dwelling?

Answered: 247 Skipped: 2

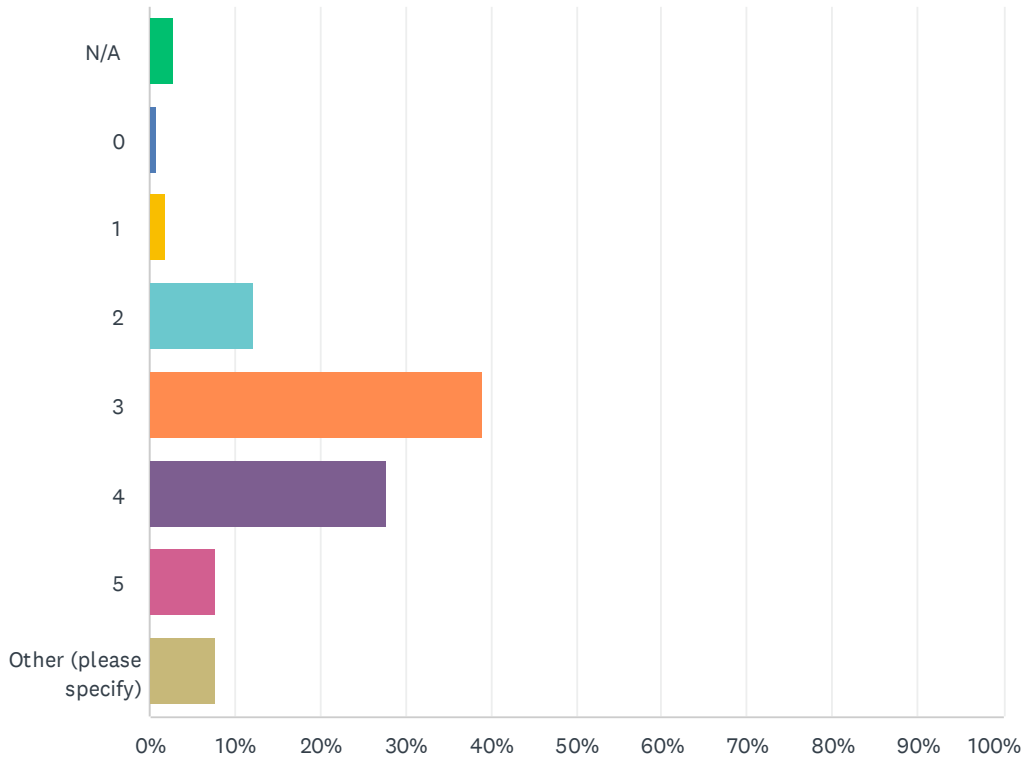


ANSWER CHOICES	RESPONSES	
N/A	2.02%	5
Less than 500 ft2	3.24%	8
Between 500 and 1,000 ft2	26.72%	66
Between 1,000 and 1,500 ft2	33.60%	83
Between 1,500 and 2,000 ft2	19.84%	49
More than 2,000 ft2	13.77%	34
Other (please specify)	0.81%	2
TOTAL		247

#	OTHER (PLEASE SPECIFY)	DATE
1	2500	8/29/2022 11:18 AM
2	All buildings burned many years ago .	8/24/2022 10:26 AM

Q6 6. How many bedrooms does the main dwellings have?

Answered: 248 Skipped: 1



ANSWER CHOICES	RESPONSES
N/A	2.82% 7
0	0.81% 2
1	2.02% 5
2	12.10% 30
3	39.11% 97
4	27.82% 69
5	7.66% 19
Other (please specify)	7.66% 19
TOTAL	248

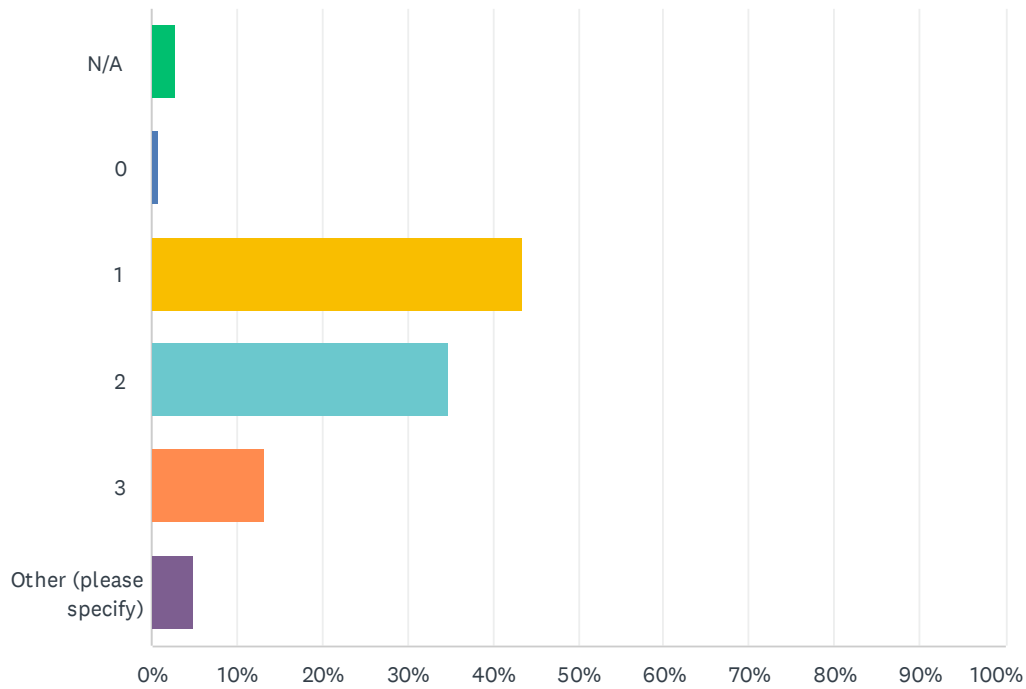
#	OTHER (PLEASE SPECIFY)	DATE
1	6	8/30/2022 7:30 AM
2	6	8/26/2022 7:44 PM
3	7	8/26/2022 4:56 PM
4	Two Bedrooms and a loft area	8/26/2022 1:20 PM

Big Shell Lake Capacity Study Survey

5	98	8/26/2022 1:15 PM
6	six	8/26/2022 12:47 PM
7	6	8/23/2022 1:43 PM
8	8 bedrooms	8/17/2022 9:06 PM
9	6	8/17/2022 8:00 PM
10	6	8/16/2022 5:15 PM
11	6	8/9/2022 9:07 PM
12	6	8/9/2022 2:50 PM
13	6	8/8/2022 9:18 AM
14	8	8/8/2022 8:53 AM
15	6	8/7/2022 10:29 PM
16	6	8/2/2022 8:27 PM
17	6	8/2/2022 8:26 PM
18	7	8/2/2022 2:10 PM
19	6	8/2/2022 8:52 AM

Q7 7. How many washrooms does the main dwelling have?

Answered: 248 Skipped: 1



ANSWER CHOICES	RESPONSES	
N/A	2.82%	7
0	0.81%	2
1	43.55%	108
2	34.68%	86
3	13.31%	33
Other (please specify)	4.84%	12
TOTAL		248

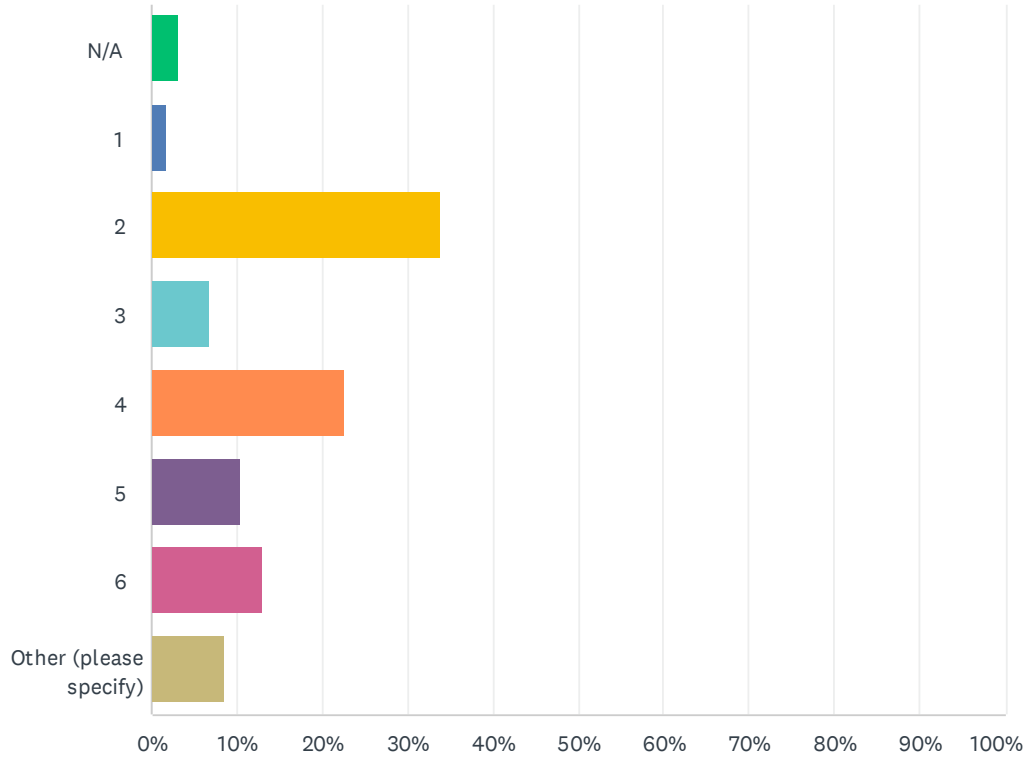
#	OTHER (PLEASE SPECIFY)	DATE
1	4	8/30/2022 3:24 PM
2	4	8/27/2022 9:49 PM
3	4	8/26/2022 8:08 PM
4	4	8/26/2022 4:56 PM
5	Four	8/26/2022 4:29 PM
6	8	8/26/2022 1:15 PM
7	Outdoor toilet	8/23/2022 2:53 PM
8	1.5	8/22/2022 2:01 PM

Big Shell Lake Capacity Study Survey

9	4	8/21/2022 6:37 PM
10	8 bathrooms	8/17/2022 9:06 PM
11	4	8/8/2022 7:37 AM
12	4	8/6/2022 4:27 PM

Q8 8. On average, how many people typically stay at your property at one time?

Answered: 248 Skipped: 1



ANSWER CHOICES	RESPONSES	
N/A	3.23%	8
1	1.61%	4
2	33.87%	84
3	6.85%	17
4	22.58%	56
5	10.48%	26
6	12.90%	32
Other (please specify)	8.47%	21
TOTAL		248

#	OTHER (PLEASE SPECIFY)	DATE
1	10	8/30/2022 7:30 AM
2	11	8/29/2022 11:18 AM
3	2 - 6	8/29/2022 10:36 AM

Big Shell Lake Capacity Study Survey

4	2-4	8/26/2022 5:52 PM
5	8	8/26/2022 4:56 PM
6	20	8/26/2022 1:15 PM
7	Varies as to vacation days of kids can from 2 to 6 at a time	8/26/2022 12:32 PM
8	9	8/15/2022 4:11 PM
9	Can sleep 12 in August	8/13/2022 8:49 PM
10	2.5	8/12/2022 6:28 PM
11	8	8/11/2022 4:32 PM
12	9	8/10/2022 5:06 PM
13	7	8/10/2022 2:16 PM
14	8	8/8/2022 4:58 PM
15	There is no average. We can be from 2-15 people	8/8/2022 1:07 PM
16	Primary residents. 6when company comes occasionally	8/8/2022 9:53 AM
17	highly variable. 2-16. Most often 4.	8/8/2022 9:18 AM
18	Summer up to 10 family But 1 permanent	8/8/2022 8:53 AM
19	7	8/3/2022 10:02 PM
20	10	8/2/2022 8:27 PM
21	8	8/2/2022 2:10 PM

Q9 9. Approximately, how often over the course of a year is your property occupied? [See Analysis on Page 39](#)

Answered: 228 Skipped: 21

ANSWER CHOICES	RESPONSES	
Total spring days:	97.37%	222
Total summer days:	99.12%	226
Total fall days:	96.93%	221
Total winter days:	90.79%	207

#	TOTAL SPRING DAYS:	DATE
1	15	8/31/2022 8:51 PM
2	5	8/31/2022 7:45 PM
3	5	8/31/2022 7:33 PM
4	12	8/31/2022 7:27 PM
5	365 total	8/31/2022 1:52 PM
6	10	8/30/2022 10:51 PM
7	10	8/30/2022 10:36 PM
8	6	8/30/2022 10:02 PM
9	30	8/30/2022 9:34 PM
10	91	8/30/2022 6:42 PM
11	91	8/30/2022 3:24 PM
12	24	8/30/2022 8:51 AM
13	5-10	8/30/2022 7:30 AM
14	90	8/29/2022 9:18 PM
15	30	8/29/2022 11:18 AM
16	10	8/29/2022 10:36 AM
17	45	8/29/2022 8:14 AM
18	15	8/28/2022 11:36 PM
19	20	8/28/2022 3:46 PM
20	4	8/28/2022 12:42 PM
21	30	8/28/2022 12:33 PM
22	50%	8/28/2022 10:26 AM
23	12	8/27/2022 9:49 PM
24	45	8/27/2022 7:37 PM
25	91	8/27/2022 5:01 PM
26	All spring	8/27/2022 4:28 PM

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27	15	8/27/2022 12:34 PM
28	15	8/27/2022 11:19 AM
29	20	8/27/2022 9:30 AM
30	90	8/26/2022 8:08 PM
31	15	8/26/2022 7:44 PM
32	50	8/26/2022 6:59 PM
33	20	8/26/2022 5:52 PM
34	6	8/26/2022 5:13 PM
35	6	8/26/2022 4:56 PM
36	91	8/26/2022 4:41 PM
37	20	8/26/2022 4:38 PM
38	12	8/26/2022 4:29 PM
39	18	8/26/2022 3:54 PM
40	10	8/26/2022 2:50 PM
41	60	8/26/2022 2:32 PM
42	20	8/26/2022 2:31 PM
43	10	8/26/2022 1:59 PM
44	50	8/26/2022 1:35 PM
45	50	8/26/2022 1:29 PM
46	14	8/26/2022 1:20 PM
47	12	8/26/2022 1:00 PM
48	25	8/26/2022 12:47 PM
49	Yes	8/26/2022 12:43 PM
50	90%	8/26/2022 12:39 PM
51	30	8/26/2022 12:32 PM
52	45	8/25/2022 2:30 PM
53	91	8/25/2022 7:18 AM
54	All	8/24/2022 5:20 PM
55	all	8/24/2022 1:35 PM
56	8	8/24/2022 7:56 AM
57	10 days	8/23/2022 7:35 PM
58	10	8/23/2022 4:23 PM
59	1	8/23/2022 2:53 PM
60	88	8/23/2022 1:43 PM
61	20	8/23/2022 7:38 AM
62	20	8/22/2022 10:41 PM
63	15	8/22/2022 9:40 PM
64	90	8/22/2022 4:44 PM

Big Shell Lake Capacity Study Survey

65	20	8/22/2022 2:36 PM
66	20	8/22/2022 2:01 PM
67	20	8/22/2022 12:10 PM
68	30	8/22/2022 12:03 PM
69	4	8/22/2022 11:31 AM
70	10	8/22/2022 8:00 AM
71	91.25	8/21/2022 6:37 PM
72	30	8/19/2022 9:58 AM
73	90+	8/19/2022 6:15 AM
74	30	8/18/2022 5:35 PM
75	90	8/18/2022 7:31 AM
76	90	8/18/2022 7:30 AM
77	12	8/17/2022 9:06 PM
78	10	8/17/2022 8:00 PM
79	5	8/17/2022 1:58 PM
80	0	8/16/2022 9:31 PM
81	10	8/16/2022 3:10 PM
82	12	8/16/2022 3:04 PM
83	10	8/15/2022 4:35 PM
84	10	8/15/2022 4:11 PM
85	20	8/15/2022 3:48 PM
86	15	8/15/2022 1:09 PM
87	0	8/14/2022 8:04 PM
88	Many	8/14/2022 7:45 PM
89	5	8/14/2022 12:56 PM
90	15	8/14/2022 12:00 AM
91	6	8/13/2022 11:34 AM
92	30	8/13/2022 9:58 AM
93	90	8/13/2022 9:41 AM
94	All	8/12/2022 9:41 PM
95	10	8/12/2022 8:58 PM
96	25	8/12/2022 6:28 PM
97	60	8/12/2022 6:49 AM
98	15	8/12/2022 6:33 AM
99	30	8/11/2022 11:14 PM
100	4	8/11/2022 6:41 PM
101	6	8/11/2022 5:34 PM
102	10	8/11/2022 4:16 PM

Big Shell Lake Capacity Study Survey

103	10	8/11/2022 1:08 PM
104	12	8/11/2022 1:01 PM
105	30	8/11/2022 9:37 AM
106	18	8/10/2022 5:06 PM
107	12	8/10/2022 3:07 PM
108	15	8/10/2022 2:16 PM
109	30	8/10/2022 1:12 PM
110	5	8/10/2022 8:29 AM
111	Every weekend	8/10/2022 6:23 AM
112	30	8/9/2022 11:20 PM
113	4	8/9/2022 9:07 PM
114	25	8/9/2022 6:43 PM
115	6	8/9/2022 6:22 PM
116	Always	8/9/2022 2:50 PM
117	15	8/9/2022 11:53 AM
118	6	8/9/2022 11:06 AM
119	All	8/9/2022 7:29 AM
120	25	8/9/2022 7:29 AM
121	3 month	8/8/2022 10:16 PM
122	10 days	8/8/2022 8:37 PM
123	20	8/8/2022 8:06 PM
124	20-30	8/8/2022 8:03 PM
125	7	8/8/2022 7:11 PM
126	15	8/8/2022 2:12 PM
127	6	8/8/2022 1:07 PM
128	21	8/8/2022 10:03 AM
129	20	8/8/2022 10:03 AM
130	all	8/8/2022 9:53 AM
131	20 PERCENT	8/8/2022 9:30 AM
132	6	8/8/2022 9:26 AM
133	2	8/8/2022 9:18 AM
134	15	8/8/2022 9:12 AM
135	Depends	8/8/2022 8:53 AM
136	12	8/8/2022 8:38 AM
137	10	8/8/2022 8:37 AM
138	15	8/8/2022 8:20 AM
139	30	8/8/2022 8:07 AM
140	40	8/8/2022 6:33 AM

Big Shell Lake Capacity Study Survey

141	14	8/8/2022 12:10 AM
142	12	8/7/2022 11:50 PM
143	31	8/7/2022 10:52 PM
144	3 months	8/7/2022 9:36 PM
145	20	8/7/2022 9:29 PM
146	20	8/7/2022 9:28 PM
147	10	8/7/2022 9:27 PM
148	45	8/7/2022 9:17 PM
149	10	8/7/2022 9:17 PM
150	5	8/7/2022 9:16 PM
151	50	8/7/2022 9:13 PM
152	100	8/7/2022 1:07 PM
153	20	8/7/2022 9:34 AM
154	30	8/6/2022 4:34 PM
155	20	8/6/2022 2:22 PM
156	8	8/5/2022 10:29 PM
157	4	8/5/2022 5:22 PM
158	16	8/5/2022 9:34 AM
159	15	8/5/2022 9:07 AM
160	60	8/4/2022 9:28 PM
161	14	8/4/2022 8:54 PM
162	All	8/4/2022 3:32 PM
163	20	8/3/2022 10:02 PM
164	30	8/3/2022 7:07 PM
165	91	8/3/2022 2:00 PM
166	20	8/3/2022 12:28 PM
167	14	8/3/2022 9:30 AM
168	8	8/3/2022 8:13 AM
169	25	8/3/2022 6:19 AM
170	91.25	8/2/2022 11:06 PM
171	6	8/2/2022 10:53 PM
172	30	8/2/2022 10:41 PM
173	92	8/2/2022 9:50 PM
174	10	8/2/2022 9:30 PM
175	30	8/2/2022 9:30 PM
176	5	8/2/2022 9:27 PM
177	6	8/2/2022 9:16 PM
178	14	8/2/2022 9:07 PM

Big Shell Lake Capacity Study Survey

179	26	8/2/2022 8:56 PM
180	5	8/2/2022 8:54 PM
181	10	8/2/2022 8:39 PM
182	10	8/2/2022 8:34 PM
183	All	8/2/2022 8:28 PM
184	5	8/2/2022 8:27 PM
185	30	8/2/2022 8:26 PM
186	30	8/2/2022 8:20 PM
187	100	8/2/2022 8:15 PM
188	10	8/2/2022 5:56 PM
189	50	8/2/2022 5:55 PM
190	25	8/2/2022 5:48 PM
191	5	8/2/2022 3:57 PM
192	6	8/2/2022 2:14 PM
193	5	8/2/2022 2:10 PM
194	55	8/2/2022 12:20 PM
195	16	8/2/2022 12:10 PM
196	365	8/2/2022 12:10 PM
197	8	8/2/2022 10:45 AM
198	15	8/2/2022 10:43 AM
199	8	8/2/2022 10:42 AM
200	8 days	8/2/2022 10:34 AM
201	5	8/2/2022 10:15 AM
202	15 days	8/2/2022 10:04 AM
203	30	8/2/2022 9:47 AM
204	40	8/2/2022 9:38 AM
205	7	8/2/2022 9:25 AM
206	5	8/2/2022 9:22 AM
207	40+	8/2/2022 9:21 AM
208	20	8/2/2022 9:16 AM
209	20	8/2/2022 9:16 AM
210	6	8/2/2022 9:09 AM
211	10	8/2/2022 9:09 AM
212	5	8/2/2022 9:05 AM
213	55	8/2/2022 9:03 AM
214	30	8/2/2022 8:53 AM
215	6	8/2/2022 8:52 AM
216	45	8/2/2022 8:26 AM

Big Shell Lake Capacity Study Survey

217	3	8/2/2022 7:48 AM
218	30	8/2/2022 6:52 AM
219	80	8/1/2022 11:31 PM
220	14	8/1/2022 10:45 PM
221	5	8/1/2022 10:28 PM
222	6	8/1/2022 9:16 PM
#	TOTAL SUMMER DAYS:	DATE
1	40	8/31/2022 8:51 PM
2	40	8/31/2022 7:45 PM
3	40	8/31/2022 7:33 PM
4	20	8/31/2022 7:27 PM
5	20	8/30/2022 10:51 PM
6	40	8/30/2022 10:36 PM
7	16	8/30/2022 10:02 PM
8	30	8/30/2022 9:34 PM
9	91	8/30/2022 6:42 PM
10	91	8/30/2022 3:24 PM
11	24	8/30/2022 8:51 AM
12	45	8/30/2022 7:30 AM
13	90	8/29/2022 9:18 PM
14	40	8/29/2022 3:50 PM
15	45	8/29/2022 11:18 AM
16	30	8/29/2022 10:36 AM
17	65	8/29/2022 8:14 AM
18	30	8/28/2022 11:36 PM
19	60	8/28/2022 3:46 PM
20	30	8/28/2022 12:42 PM
21	60	8/28/2022 12:33 PM
22	70%	8/28/2022 10:26 AM
23	26	8/27/2022 9:49 PM
24	75	8/27/2022 7:37 PM
25	91	8/27/2022 5:01 PM
26	All summer	8/27/2022 4:28 PM
27	50	8/27/2022 12:34 PM
28	Varies	8/27/2022 12:10 PM
29	60	8/27/2022 11:19 AM
30	45	8/27/2022 9:30 AM
31	90	8/26/2022 8:08 PM

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32	90	8/26/2022 7:44 PM
33	62	8/26/2022 6:59 PM
34	70	8/26/2022 5:52 PM
35	20	8/26/2022 5:13 PM
36	25	8/26/2022 4:56 PM
37	91	8/26/2022 4:41 PM
38	30	8/26/2022 4:38 PM
39	60	8/26/2022 4:29 PM
40	27	8/26/2022 3:54 PM
41	32	8/26/2022 2:50 PM
42	60	8/26/2022 2:32 PM
43	20	8/26/2022 2:31 PM
44	20	8/26/2022 1:59 PM
45	130	8/26/2022 1:35 PM
46	30	8/26/2022 1:29 PM
47	30	8/26/2022 1:20 PM
48	40	8/26/2022 1:00 PM
49	90	8/26/2022 12:47 PM
50	Yes	8/26/2022 12:43 PM
51	90%	8/26/2022 12:39 PM
52	50	8/26/2022 12:32 PM
53	45	8/25/2022 2:30 PM
54	91	8/25/2022 7:18 AM
55	All	8/24/2022 5:20 PM
56	all	8/24/2022 1:35 PM
57	45	8/24/2022 7:56 AM
58	25 to 30 days	8/23/2022 7:35 PM
59	90	8/23/2022 4:23 PM
60	3	8/23/2022 2:53 PM
61	92	8/23/2022 1:43 PM
62	20	8/23/2022 7:38 AM
63	45	8/22/2022 10:41 PM
64	30	8/22/2022 9:40 PM
65	90	8/22/2022 4:44 PM
66	60	8/22/2022 2:36 PM
67	40	8/22/2022 2:01 PM
68	40	8/22/2022 12:10 PM
69	60	8/22/2022 12:03 PM

Big Shell Lake Capacity Study Survey

70	15	8/22/2022 11:31 AM
71	20	8/22/2022 8:00 AM
72	91.25	8/21/2022 6:37 PM
73	40	8/19/2022 9:58 AM
74	90+	8/19/2022 6:15 AM
75	60	8/18/2022 5:35 PM
76	90	8/18/2022 7:31 AM
77	90	8/18/2022 7:30 AM
78	24	8/17/2022 9:06 PM
79	35	8/17/2022 8:00 PM
80	10	8/17/2022 1:58 PM
81	0	8/16/2022 9:31 PM
82	30	8/16/2022 5:15 PM
83	30	8/16/2022 3:10 PM
84	30	8/16/2022 3:04 PM
85	45	8/15/2022 4:35 PM
86	45	8/15/2022 4:11 PM
87	60	8/15/2022 3:48 PM
88	35	8/15/2022 1:09 PM
89	most of June/July/August	8/14/2022 8:04 PM
90	Many	8/14/2022 7:45 PM
91	20	8/14/2022 12:56 PM
92	40	8/14/2022 12:00 AM
93	20	8/13/2022 8:49 PM
94	25	8/13/2022 11:34 AM
95	50	8/13/2022 9:58 AM
96	90	8/13/2022 9:41 AM
97	All	8/12/2022 9:41 PM
98	60	8/12/2022 8:58 PM
99	40	8/12/2022 6:28 PM
100	90	8/12/2022 6:49 AM
101	25	8/12/2022 6:33 AM
102	75	8/11/2022 11:14 PM
103	18	8/11/2022 6:41 PM
104	45	8/11/2022 5:34 PM
105	60	8/11/2022 4:16 PM
106	30	8/11/2022 1:08 PM
107	60	8/11/2022 1:01 PM

Big Shell Lake Capacity Study Survey

108	70	8/11/2022 9:37 AM
109	32	8/10/2022 5:06 PM
110	40	8/10/2022 3:07 PM
111	60	8/10/2022 2:16 PM
112	90	8/10/2022 1:12 PM
113	5	8/10/2022 8:29 AM
114	Every weekend plus two weeks holidays	8/10/2022 6:23 AM
115	61	8/9/2022 11:20 PM
116	20	8/9/2022 9:07 PM
117	60	8/9/2022 6:43 PM
118	25	8/9/2022 6:22 PM
119	Always	8/9/2022 2:50 PM
120	25	8/9/2022 11:53 AM
121	32	8/9/2022 11:06 AM
122	All	8/9/2022 7:29 AM
123	60	8/9/2022 7:29 AM
124	3 monthd	8/8/2022 10:16 PM
125	40	8/8/2022 8:37 PM
126	30	8/8/2022 8:06 PM
127	40-60	8/8/2022 8:03 PM
128	40	8/8/2022 7:11 PM
129	50	8/8/2022 4:58 PM
130	80	8/8/2022 2:12 PM
131	25	8/8/2022 1:07 PM
132	60	8/8/2022 10:03 AM
133	25	8/8/2022 10:03 AM
134	all	8/8/2022 9:53 AM
135	40 PERCENT	8/8/2022 9:30 AM
136	30	8/8/2022 9:26 AM
137	10	8/8/2022 9:18 AM
138	20	8/8/2022 9:12 AM
139	10	8/8/2022 8:53 AM
140	40	8/8/2022 8:38 AM
141	40	8/8/2022 8:37 AM
142	30	8/8/2022 8:20 AM
143	40	8/8/2022 8:07 AM
144	60	8/8/2022 6:33 AM
145	30	8/8/2022 12:10 AM

Big Shell Lake Capacity Study Survey

146	42	8/7/2022 11:50 PM
147	92	8/7/2022 10:52 PM
148	30	8/7/2022 10:29 PM
149	3 months	8/7/2022 9:36 PM
150	30	8/7/2022 9:29 PM
151	40	8/7/2022 9:28 PM
152	20	8/7/2022 9:27 PM
153	75	8/7/2022 9:17 PM
154	40	8/7/2022 9:17 PM
155	35	8/7/2022 9:16 PM
156	50	8/7/2022 9:13 PM
157	100	8/7/2022 1:07 PM
158	30	8/7/2022 9:34 AM
159	60	8/6/2022 4:34 PM
160	80	8/6/2022 2:22 PM
161	25	8/5/2022 10:29 PM
162	20	8/5/2022 5:22 PM
163	42	8/5/2022 9:34 AM
164	30	8/5/2022 9:07 AM
165	60	8/4/2022 9:28 PM
166	30	8/4/2022 8:54 PM
167	All	8/4/2022 3:32 PM
168	40	8/3/2022 10:02 PM
169	45	8/3/2022 7:07 PM
170	91	8/3/2022 2:00 PM
171	40	8/3/2022 12:28 PM
172	40	8/3/2022 9:30 AM
173	45	8/3/2022 8:13 AM
174	25	8/3/2022 6:19 AM
175	91.25	8/2/2022 11:06 PM
176	28	8/2/2022 10:53 PM
177	90	8/2/2022 10:41 PM
178	92	8/2/2022 9:50 PM
179	60	8/2/2022 9:30 PM
180	45	8/2/2022 9:30 PM
181	30	8/2/2022 9:27 PM
182	21	8/2/2022 9:16 PM
183	50	8/2/2022 9:07 PM

Big Shell Lake Capacity Study Survey

184	26	8/2/2022 8:56 PM
185	20	8/2/2022 8:54 PM
186	30	8/2/2022 8:39 PM
187	30	8/2/2022 8:34 PM
188	All	8/2/2022 8:28 PM
189	20	8/2/2022 8:27 PM
190	45	8/2/2022 8:26 PM
191	50	8/2/2022 8:20 PM
192	100	8/2/2022 8:15 PM
193	40	8/2/2022 5:56 PM
194	50	8/2/2022 5:55 PM
195	40	8/2/2022 5:48 PM
196	30	8/2/2022 3:57 PM
197	15	8/2/2022 2:14 PM
198	20	8/2/2022 2:10 PM
199	70	8/2/2022 12:20 PM
200	30	8/2/2022 12:10 PM
201	24	8/2/2022 10:45 AM
202	30	8/2/2022 10:43 AM
203	20	8/2/2022 10:42 AM
204	15	8/2/2022 10:34 AM
205	20	8/2/2022 10:15 AM
206	30 days	8/2/2022 10:04 AM
207	60	8/2/2022 9:47 AM
208	50	8/2/2022 9:38 AM
209	35	8/2/2022 9:25 AM
210	39	8/2/2022 9:22 AM
211	All summer	8/2/2022 9:21 AM
212	35	8/2/2022 9:16 AM
213	40	8/2/2022 9:16 AM
214	20	8/2/2022 9:09 AM
215	20	8/2/2022 9:09 AM
216	15	8/2/2022 9:05 AM
217	90	8/2/2022 9:03 AM
218	50	8/2/2022 8:53 AM
219	30	8/2/2022 8:52 AM
220	60	8/2/2022 8:26 AM
221	3	8/2/2022 7:48 AM

Big Shell Lake Capacity Study Survey

222	90	8/2/2022 6:52 AM
223	90	8/1/2022 11:31 PM
224	30	8/1/2022 10:45 PM
225	30	8/1/2022 10:28 PM
226	30	8/1/2022 9:16 PM
#	TOTAL FALL DAYS:	DATE
1	10	8/31/2022 8:51 PM
2	10	8/31/2022 7:45 PM
3	10	8/31/2022 7:33 PM
4	8	8/31/2022 7:27 PM
5	10	8/30/2022 10:51 PM
6	10	8/30/2022 10:36 PM
7	6	8/30/2022 10:02 PM
8	30	8/30/2022 9:34 PM
9	91	8/30/2022 6:42 PM
10	91	8/30/2022 3:24 PM
11	24	8/30/2022 8:51 AM
12	15	8/30/2022 7:30 AM
13	32	8/29/2022 9:18 PM
14	30	8/29/2022 11:18 AM
15	25	8/29/2022 10:36 AM
16	45	8/29/2022 8:14 AM
17	15	8/28/2022 11:36 PM
18	20	8/28/2022 3:46 PM
19	30	8/28/2022 12:33 PM
20	60%	8/28/2022 10:26 AM
21	12	8/27/2022 9:49 PM
22	30	8/27/2022 7:37 PM
23	91	8/27/2022 5:01 PM
24	All fall	8/27/2022 4:28 PM
25	15	8/27/2022 12:34 PM
26	15	8/27/2022 11:19 AM
27	15	8/27/2022 9:30 AM
28	90	8/26/2022 8:08 PM
29	20	8/26/2022 7:44 PM
30	30	8/26/2022 6:59 PM
31	25	8/26/2022 5:52 PM
32	12	8/26/2022 5:13 PM

Big Shell Lake Capacity Study Survey

33	4	8/26/2022 4:56 PM
34	91	8/26/2022 4:41 PM
35	10	8/26/2022 4:38 PM
36	60	8/26/2022 4:29 PM
37	15	8/26/2022 3:54 PM
38	8	8/26/2022 2:50 PM
39	60	8/26/2022 2:32 PM
40	16	8/26/2022 2:31 PM
41	5	8/26/2022 1:59 PM
42	10	8/26/2022 1:35 PM
43	30	8/26/2022 1:29 PM
44	14	8/26/2022 1:20 PM
45	12	8/26/2022 1:00 PM
46	50	8/26/2022 12:47 PM
47	Yes	8/26/2022 12:43 PM
48	90%	8/26/2022 12:39 PM
49	45	8/26/2022 12:32 PM
50	45	8/25/2022 2:30 PM
51	91	8/25/2022 7:18 AM
52	All	8/24/2022 5:20 PM
53	all	8/24/2022 1:35 PM
54	6	8/24/2022 7:56 AM
55	10 to 15 days	8/23/2022 7:35 PM
56	10	8/23/2022 4:23 PM
57	1	8/23/2022 2:53 PM
58	88	8/23/2022 1:43 PM
59	20	8/23/2022 7:38 AM
60	20	8/22/2022 10:41 PM
61	15	8/22/2022 9:40 PM
62	90	8/22/2022 4:44 PM
63	20	8/22/2022 2:36 PM
64	20	8/22/2022 2:01 PM
65	30	8/22/2022 12:10 PM
66	30	8/22/2022 12:03 PM
67	4	8/22/2022 11:31 AM
68	10	8/22/2022 8:00 AM
69	91.25	8/21/2022 6:37 PM
70	25	8/19/2022 9:58 AM

Big Shell Lake Capacity Study Survey

71	90+	8/19/2022 6:15 AM
72	30	8/18/2022 5:35 PM
73	90	8/18/2022 7:31 AM
74	90	8/18/2022 7:30 AM
75	12	8/17/2022 9:06 PM
76	10	8/17/2022 8:00 PM
77	5	8/17/2022 1:58 PM
78	0	8/16/2022 9:31 PM
79	6	8/16/2022 5:15 PM
80	20	8/16/2022 3:10 PM
81	12	8/16/2022 3:04 PM
82	5	8/15/2022 4:35 PM
83	5	8/15/2022 4:11 PM
84	6	8/15/2022 3:48 PM
85	15	8/15/2022 1:09 PM
86	0	8/14/2022 8:04 PM
87	Many	8/14/2022 7:45 PM
88	10	8/14/2022 12:56 PM
89	7	8/14/2022 12:00 AM
90	10	8/13/2022 8:49 PM
91	6	8/13/2022 11:34 AM
92	30	8/13/2022 9:58 AM
93	90	8/13/2022 9:41 AM
94	All	8/12/2022 9:41 PM
95	10	8/12/2022 8:58 PM
96	15	8/12/2022 6:28 PM
97	30	8/12/2022 6:49 AM
98	10	8/12/2022 6:33 AM
99	10	8/11/2022 11:14 PM
100	4	8/11/2022 6:41 PM
101	6	8/11/2022 5:34 PM
102	15	8/11/2022 4:16 PM
103	10	8/11/2022 1:08 PM
104	7	8/11/2022 1:01 PM
105	18	8/11/2022 9:37 AM
106	12	8/10/2022 5:06 PM
107	12	8/10/2022 3:07 PM
108	10	8/10/2022 2:16 PM

Big Shell Lake Capacity Study Survey

109	30	8/10/2022 1:12 PM
110	5	8/10/2022 8:29 AM
111	Every weekend plus two weeks holidays	8/10/2022 6:23 AM
112	30	8/9/2022 11:20 PM
113	4	8/9/2022 9:07 PM
114	5	8/9/2022 6:43 PM
115	6	8/9/2022 6:22 PM
116	Always	8/9/2022 2:50 PM
117	15	8/9/2022 11:53 AM
118	12	8/9/2022 11:06 AM
119	All	8/9/2022 7:29 AM
120	30	8/9/2022 7:29 AM
121	3	8/8/2022 10:16 PM
122	20	8/8/2022 8:37 PM
123	15	8/8/2022 8:06 PM
124	6-10	8/8/2022 8:03 PM
125	5	8/8/2022 7:11 PM
126	10	8/8/2022 4:58 PM
127	15	8/8/2022 2:12 PM
128	4	8/8/2022 1:07 PM
129	15	8/8/2022 10:03 AM
130	all	8/8/2022 9:53 AM
131	20 PERCENT	8/8/2022 9:30 AM
132	10	8/8/2022 9:26 AM
133	2	8/8/2022 9:18 AM
134	10	8/8/2022 9:12 AM
135	Depends	8/8/2022 8:53 AM
136	20	8/8/2022 8:38 AM
137	10	8/8/2022 8:37 AM
138	15	8/8/2022 8:20 AM
139	20	8/8/2022 8:07 AM
140	40	8/8/2022 6:33 AM
141	7	8/8/2022 12:10 AM
142	12	8/7/2022 11:50 PM
143	90	8/7/2022 10:52 PM
144	3 months	8/7/2022 9:36 PM
145	20	8/7/2022 9:29 PM
146	20	8/7/2022 9:28 PM

Big Shell Lake Capacity Study Survey

147	10	8/7/2022 9:27 PM
148	30	8/7/2022 9:17 PM
149	5	8/7/2022 9:17 PM
150	5	8/7/2022 9:16 PM
151	50	8/7/2022 9:13 PM
152	100	8/7/2022 1:07 PM
153	30	8/7/2022 9:34 AM
154	30	8/6/2022 4:34 PM
155	4040	8/6/2022 2:22 PM
156	8	8/5/2022 10:29 PM
157	3	8/5/2022 5:22 PM
158	10	8/5/2022 9:34 AM
159	20	8/5/2022 9:07 AM
160	40	8/4/2022 9:28 PM
161	14	8/4/2022 8:54 PM
162	All	8/4/2022 3:32 PM
163	10	8/3/2022 10:02 PM
164	20	8/3/2022 7:07 PM
165	91	8/3/2022 2:00 PM
166	20	8/3/2022 12:28 PM
167	7	8/3/2022 9:30 AM
168	6	8/3/2022 8:13 AM
169	25	8/3/2022 6:19 AM
170	91.25	8/2/2022 11:06 PM
171	6	8/2/2022 10:53 PM
172	30	8/2/2022 10:41 PM
173	91	8/2/2022 9:50 PM
174	10	8/2/2022 9:30 PM
175	30	8/2/2022 9:30 PM
176	5	8/2/2022 9:27 PM
177	6	8/2/2022 9:16 PM
178	14	8/2/2022 9:07 PM
179	26	8/2/2022 8:56 PM
180	10	8/2/2022 8:54 PM
181	5	8/2/2022 8:39 PM
182	10	8/2/2022 8:34 PM
183	All	8/2/2022 8:28 PM
184	5	8/2/2022 8:27 PM

Big Shell Lake Capacity Study Survey

185	40	8/2/2022 8:26 PM
186	30	8/2/2022 8:20 PM
187	100	8/2/2022 8:15 PM
188	10	8/2/2022 5:56 PM
189	50	8/2/2022 5:55 PM
190	25	8/2/2022 5:48 PM
191	2	8/2/2022 3:57 PM
192	6	8/2/2022 2:14 PM
193	3	8/2/2022 2:10 PM
194	60	8/2/2022 12:20 PM
195	16	8/2/2022 12:10 PM
196	2	8/2/2022 10:45 AM
197	15	8/2/2022 10:43 AM
198	4	8/2/2022 10:42 AM
199	8	8/2/2022 10:34 AM
200	2	8/2/2022 10:15 AM
201	10 days	8/2/2022 10:04 AM
202	20	8/2/2022 9:47 AM
203	40	8/2/2022 9:38 AM
204	7	8/2/2022 9:25 AM
205	20	8/2/2022 9:22 AM
206	50+	8/2/2022 9:21 AM
207	20	8/2/2022 9:16 AM
208	25	8/2/2022 9:16 AM
209	10	8/2/2022 9:09 AM
210	10	8/2/2022 9:09 AM
211	5	8/2/2022 9:05 AM
212	55	8/2/2022 9:03 AM
213	30	8/2/2022 8:53 AM
214	8	8/2/2022 8:52 AM
215	45	8/2/2022 8:26 AM
216	3	8/2/2022 7:48 AM
217	40	8/2/2022 6:52 AM
218	80	8/1/2022 11:31 PM
219	14	8/1/2022 10:45 PM
220	5	8/1/2022 10:28 PM
221	4	8/1/2022 9:16 PM
#	TOTAL WINTER DAYS:	DATE

Big Shell Lake Capacity Study Survey

1	5	8/31/2022 8:51 PM
2	20	8/31/2022 7:45 PM
3	20	8/31/2022 7:33 PM
4	4	8/31/2022 7:27 PM
5	40	8/30/2022 10:51 PM
6	10	8/30/2022 10:36 PM
7	0	8/30/2022 10:02 PM
8	30	8/30/2022 9:34 PM
9	92	8/30/2022 6:42 PM
10	91	8/30/2022 3:24 PM
11	24	8/30/2022 8:51 AM
12	0	8/30/2022 7:30 AM
13	21	8/29/2022 9:18 PM
14	49	8/29/2022 11:18 AM
15	30	8/29/2022 10:36 AM
16	5	8/29/2022 8:14 AM
17	15	8/28/2022 11:36 PM
18	25	8/28/2022 3:46 PM
19	15	8/28/2022 12:42 PM
20	20	8/28/2022 12:33 PM
21	25%	8/28/2022 10:26 AM
22	10	8/27/2022 9:49 PM
23	92	8/27/2022 5:01 PM
24	Gone half the winter	8/27/2022 4:28 PM
25	15	8/27/2022 12:34 PM
26	25	8/27/2022 11:19 AM
27	30	8/27/2022 9:30 AM
28	90	8/26/2022 8:08 PM
29	10	8/26/2022 7:44 PM
30	0	8/26/2022 5:52 PM
31	8	8/26/2022 4:56 PM
32	91	8/26/2022 4:41 PM
33	15	8/26/2022 4:38 PM
34	200	8/26/2022 4:29 PM
35	15	8/26/2022 3:54 PM
36	6	8/26/2022 2:50 PM
37	16	8/26/2022 2:31 PM
38	5	8/26/2022 1:59 PM

Big Shell Lake Capacity Study Survey

39	10	8/26/2022 1:35 PM
40	0	8/26/2022 1:29 PM
41	14	8/26/2022 1:20 PM
42	20	8/26/2022 1:00 PM
43	45	8/26/2022 12:47 PM
44	Odd weekend	8/26/2022 12:43 PM
45	90%	8/26/2022 12:39 PM
46	30	8/26/2022 12:32 PM
47	45	8/25/2022 2:30 PM
48	92	8/25/2022 7:18 AM
49	All	8/24/2022 5:20 PM
50	all	8/24/2022 1:35 PM
51	16	8/24/2022 7:56 AM
52	None	8/23/2022 7:35 PM
53	0	8/23/2022 4:23 PM
54	85	8/23/2022 1:43 PM
55	20	8/23/2022 7:38 AM
56	20	8/22/2022 10:41 PM
57	30	8/22/2022 9:40 PM
58	90	8/22/2022 4:44 PM
59	20	8/22/2022 2:01 PM
60	2	8/22/2022 12:10 PM
61	3	8/22/2022 12:03 PM
62	10	8/22/2022 11:31 AM
63	20	8/22/2022 8:00 AM
64	91.25	8/21/2022 6:37 PM
65	25	8/19/2022 9:58 AM
66	90+	8/19/2022 6:15 AM
67	20	8/18/2022 5:35 PM
68	90	8/18/2022 7:31 AM
69	90	8/18/2022 7:30 AM
70	20	8/17/2022 9:06 PM
71	6	8/17/2022 8:00 PM
72	0	8/17/2022 1:58 PM
73	0	8/16/2022 9:31 PM
74	10	8/16/2022 3:10 PM
75	8	8/16/2022 3:04 PM
76	10	8/15/2022 4:35 PM

Big Shell Lake Capacity Study Survey

77	12	8/15/2022 4:11 PM
78	15	8/15/2022 1:09 PM
79	0	8/14/2022 8:04 PM
80	Many	8/14/2022 7:45 PM
81	10	8/14/2022 12:56 PM
82	10	8/14/2022 12:00 AM
83	10	8/13/2022 11:34 AM
84	10	8/13/2022 9:58 AM
85	90	8/13/2022 9:41 AM
86	50%	8/12/2022 9:41 PM
87	15	8/12/2022 8:58 PM
88	25	8/12/2022 6:28 PM
89	15	8/12/2022 6:49 AM
90	20	8/12/2022 6:33 AM
91	10	8/11/2022 11:14 PM
92	4	8/11/2022 6:41 PM
93	8	8/11/2022 5:34 PM
94	20	8/11/2022 4:16 PM
95	15	8/11/2022 1:08 PM
96	21	8/11/2022 1:01 PM
97	20	8/11/2022 9:37 AM
98	18	8/10/2022 5:06 PM
99	0	8/10/2022 3:07 PM
100	50	8/10/2022 2:16 PM
101	30	8/10/2022 1:12 PM
102	5	8/10/2022 8:29 AM
103	Every weekend plus two weeks holidays	8/10/2022 6:23 AM
104	40	8/9/2022 11:20 PM
105	14	8/9/2022 9:07 PM
106	0	8/9/2022 6:43 PM
107	10	8/9/2022 6:22 PM
108	Usually	8/9/2022 2:50 PM
109	20	8/9/2022 11:53 AM
110	8	8/9/2022 11:06 AM
111	All	8/9/2022 7:29 AM
112	20	8/9/2022 7:29 AM
113	3	8/8/2022 10:16 PM
114	35	8/8/2022 8:37 PM

Big Shell Lake Capacity Study Survey

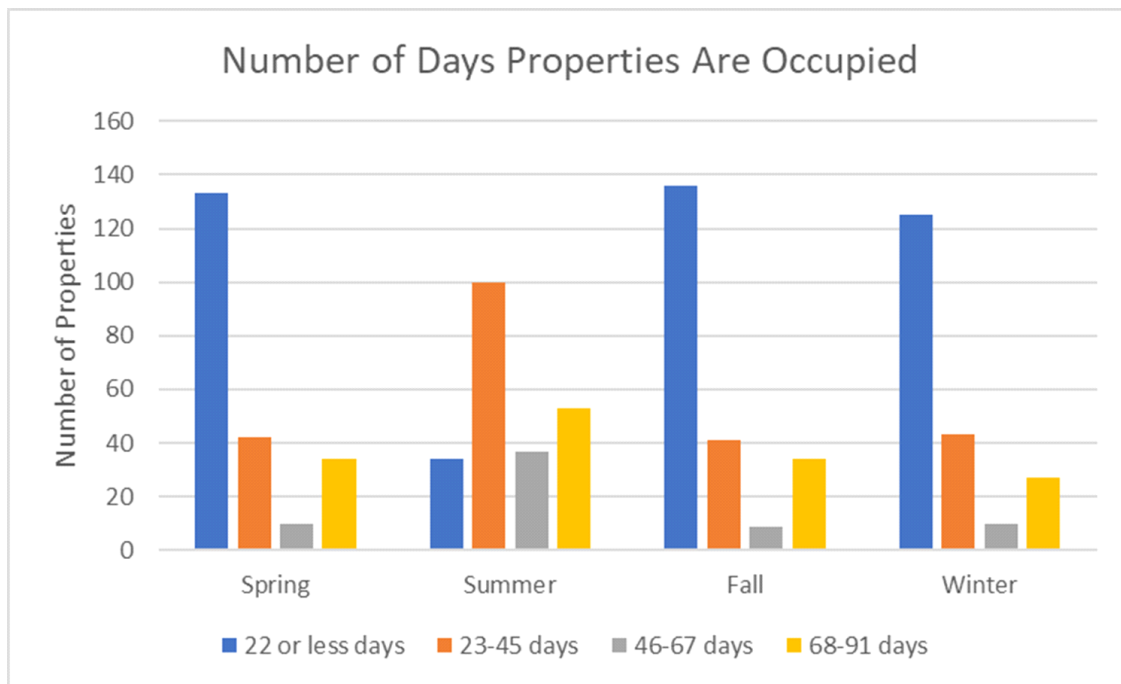
115	6-10	8/8/2022 8:03 PM
116	0	8/8/2022 7:11 PM
117	20	8/8/2022 4:58 PM
118	50	8/8/2022 2:12 PM
119	6	8/8/2022 1:07 PM
120	25	8/8/2022 10:03 AM
121	all	8/8/2022 9:53 AM
122	20 PERENT	8/8/2022 9:30 AM
123	0	8/8/2022 9:26 AM
124	2	8/8/2022 9:18 AM
125	Depends	8/8/2022 8:53 AM
126	40	8/8/2022 8:38 AM
127	10	8/8/2022 8:37 AM
128	20	8/8/2022 8:20 AM
129	30	8/8/2022 8:07 AM
130	30	8/8/2022 6:33 AM
131	14	8/8/2022 12:10 AM
132	36	8/7/2022 11:50 PM
133	31	8/7/2022 10:52 PM
134	3 months	8/7/2022 9:36 PM
135	20	8/7/2022 9:29 PM
136	40	8/7/2022 9:28 PM
137	15	8/7/2022 9:27 PM
138	30	8/7/2022 9:17 PM
139	20	8/7/2022 9:17 PM
140	10	8/7/2022 9:16 PM
141	50	8/7/2022 9:13 PM
142	65	8/7/2022 1:07 PM
143	60	8/7/2022 9:34 AM
144	40	8/6/2022 4:34 PM
145	10	8/5/2022 10:29 PM
146	6	8/5/2022 5:22 PM
147	10	8/5/2022 9:34 AM
148	20	8/5/2022 9:07 AM
149	30	8/4/2022 9:28 PM
150	10	8/4/2022 8:54 PM
151	All	8/4/2022 3:32 PM
152	2	8/3/2022 10:02 PM

Big Shell Lake Capacity Study Survey

153	0	8/3/2022 7:07 PM
154	91	8/3/2022 2:00 PM
155	20	8/3/2022 12:28 PM
156	20	8/3/2022 9:30 AM
157	8	8/3/2022 8:13 AM
158	25	8/3/2022 6:19 AM
159	91.25	8/2/2022 11:06 PM
160	0	8/2/2022 10:53 PM
161	30	8/2/2022 10:41 PM
162	90 or 91 in a leap year	8/2/2022 9:50 PM
163	5	8/2/2022 9:30 PM
164	20	8/2/2022 9:30 PM
165	5	8/2/2022 9:27 PM
166	4	8/2/2022 9:16 PM
167	18	8/2/2022 9:07 PM
168	26	8/2/2022 8:56 PM
169	8	8/2/2022 8:54 PM
170	0	8/2/2022 8:39 PM
171	All	8/2/2022 8:28 PM
172	5	8/2/2022 8:27 PM
173	40	8/2/2022 8:26 PM
174	10	8/2/2022 8:20 PM
175	65	8/2/2022 8:15 PM
176	5	8/2/2022 5:56 PM
177	50	8/2/2022 5:55 PM
178	25	8/2/2022 5:48 PM
179	3	8/2/2022 3:57 PM
180	0	8/2/2022 2:14 PM
181	5	8/2/2022 2:10 PM
182	35	8/2/2022 12:20 PM
183	30	8/2/2022 12:10 PM
184	0	8/2/2022 10:45 AM
185	10	8/2/2022 10:42 AM
186	5	8/2/2022 10:34 AM
187	20 days	8/2/2022 10:04 AM
188	30	8/2/2022 9:47 AM
189	50	8/2/2022 9:38 AM
190	5	8/2/2022 9:25 AM

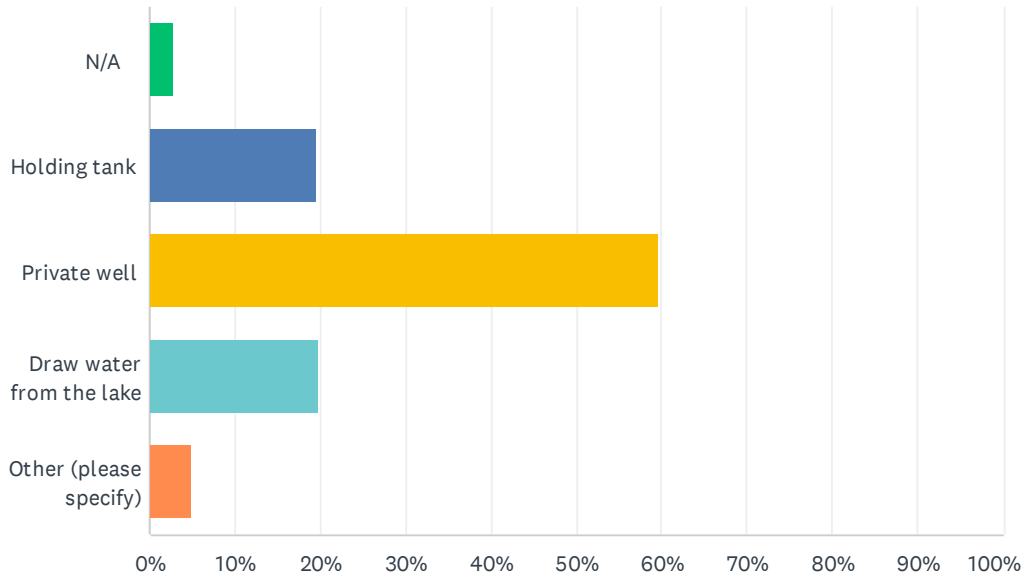
Big Shell Lake Capacity Study Survey

191	0	8/2/2022 9:22 AM
192	None	8/2/2022 9:21 AM
193	25	8/2/2022 9:16 AM
194	25	8/2/2022 9:16 AM
195	10	8/2/2022 9:09 AM
196	20	8/2/2022 9:09 AM
197	10	8/2/2022 9:05 AM
198	250	8/2/2022 9:03 AM
199	20	8/2/2022 8:53 AM
200	10	8/2/2022 8:52 AM
201	30	8/2/2022 8:26 AM
202	3	8/2/2022 7:48 AM
203	20	8/2/2022 6:52 AM
204	40	8/1/2022 11:31 PM
205	14	8/1/2022 10:45 PM
206	10	8/1/2022 10:28 PM
207	4	8/1/2022 9:16 PM



Q10 10. How is your property serviced for water?

Answered: 246 Skipped: 3

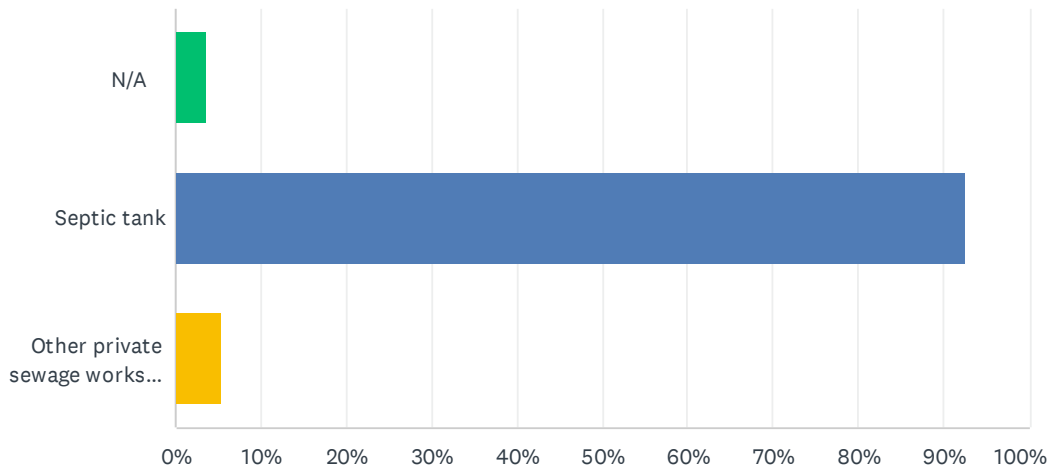


ANSWER CHOICES	RESPONSES
N/A	2.85% 7
Holding tank	19.51% 48
Private well	59.76% 147
Draw water from the lake	19.92% 49
Other (please specify)	4.88% 12
Total Respondents: 246	

#	OTHER (PLEASE SPECIFY)	DATE
1	Water hauled in	8/30/2022 10:02 PM
2	shared well with neighbor	8/26/2022 7:44 PM
3	Rain catchment and haul in drinking water each visit.	8/16/2022 3:04 PM
4	Rain collection	8/9/2022 2:50 PM
5	Potable water brought from Home in Saskatoon	8/9/2022 11:06 AM
6	Buy water jugs and city water	8/8/2022 10:16 PM
7	Water drawn from offsite	8/4/2022 9:28 PM
8	Rain	8/2/2022 5:56 PM
9	Rain from the roof	8/2/2022 10:34 AM
10	We catch rain water and carry drinking water	8/2/2022 9:25 AM
11	Rain water collection	8/1/2022 10:28 PM

Q11 11. What kind of sewage system does your property have?

Answered: 244 Skipped: 5

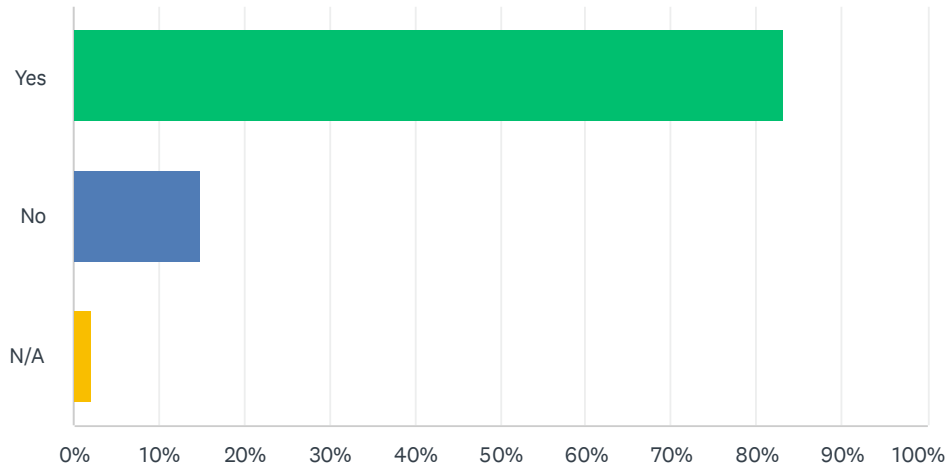


ANSWER CHOICES	RESPONSES
N/A	3.69% 9
Septic tank	92.62% 226
Other private sewage works (please specify)	5.33% 13
Total Respondents: 244	

#	OTHER PRIVATE SEWAGE WORKS (PLEASE SPECIFY)	DATE
1	1400 gal holding tank	8/31/2022 1:52 PM
2	Pump out septic tank	8/30/2022 3:24 PM
3	Contained outhouse	8/30/2022 7:30 AM
4	holding tank	8/26/2022 7:44 PM
5	Holding tank only	8/25/2022 7:18 AM
6	Holding Tank	8/24/2022 5:20 PM
7	Lagoon	8/22/2022 4:44 PM
8	Lagoon	8/22/2022 9:39 AM
9	lagoon on property	8/19/2022 6:15 AM
10	Mound	8/18/2022 7:30 AM
11	Holding tank	8/11/2022 9:37 AM
12	Holding tank	8/6/2022 4:27 PM
13	Holding tank	8/2/2022 10:34 AM

Q12 12. Is there a private dock/boat lift on Big Shell Lake associated with your property?

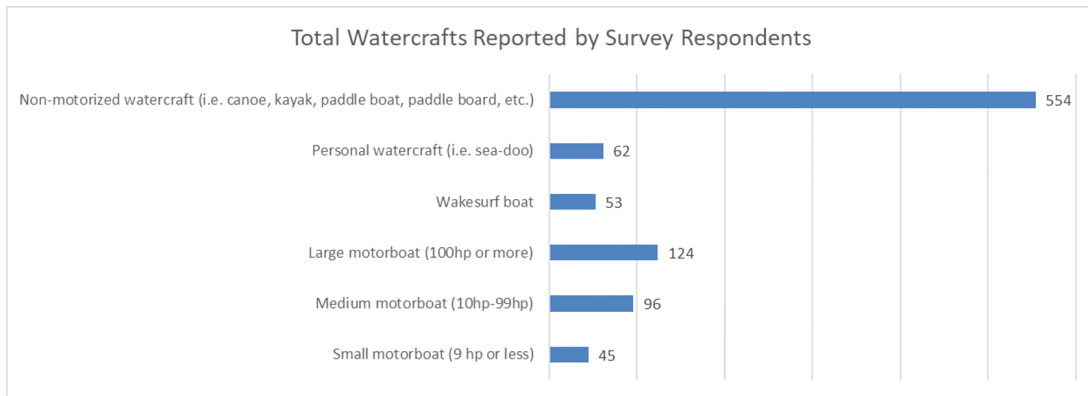
Answered: 242 Skipped: 7



ANSWER CHOICES	RESPONSES	
Yes	83.06%	201
No	14.88%	36
N/A	2.07%	5
TOTAL		242

Q13 13. How many and what kind of watercraft are associated with your property? (Please check all that apply)

Answered: 234 Skipped: 15



Big Shell Lake Capacity Study Survey

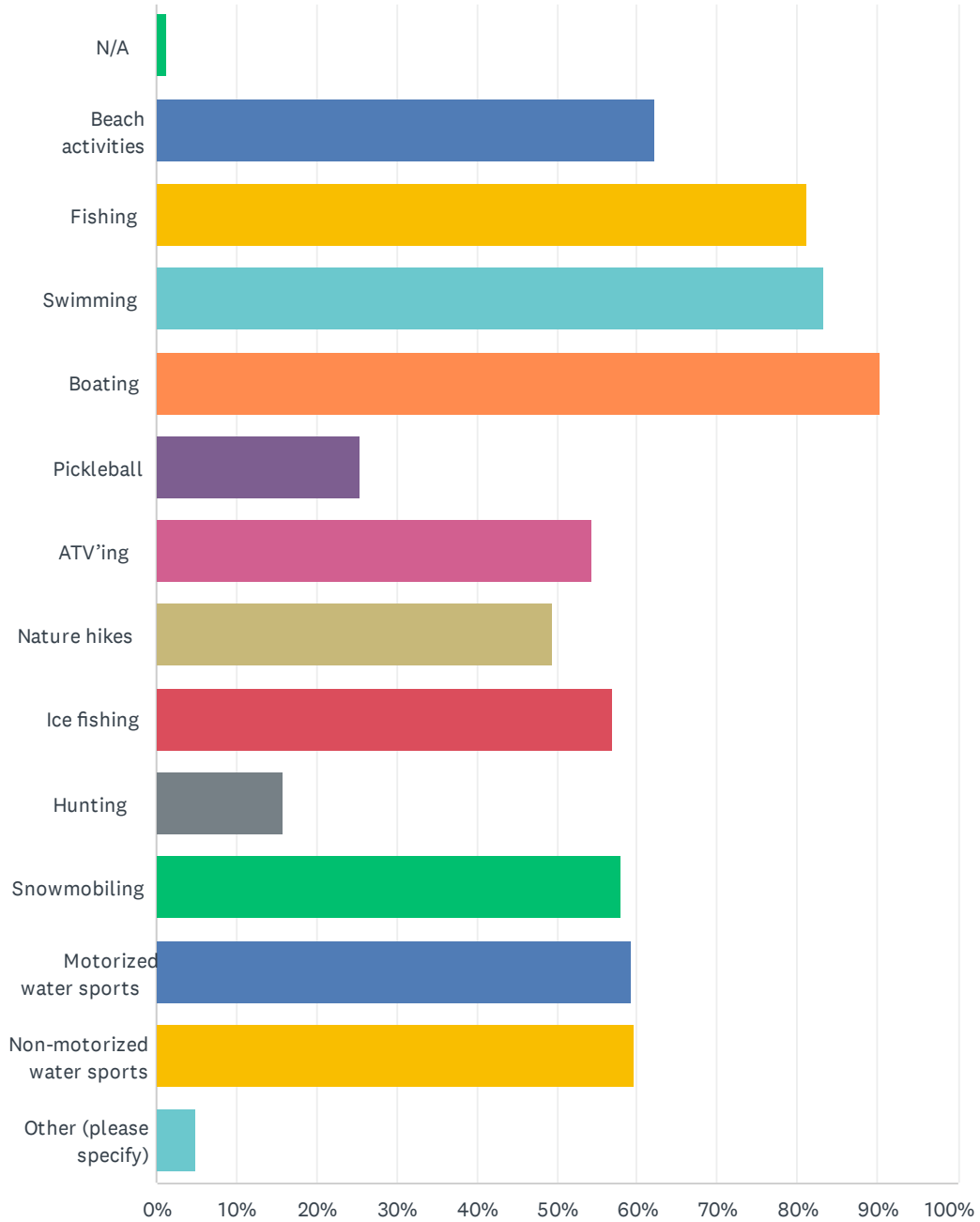
See Table on Page 44

How Many?											
	1	2	3	4	5	6	7	8	9	10	TOTAL
Small motorboat (9 hp or less):	95.35% 41	4.65% 2	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	43
Medium motorboat (10hp-99hp):	98.95% 94	1.05% 1	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	95
Large motorboat (100hp or more):	94.02% 110	5.98% 7	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	117
Wakesurf boat:	100.00% 53	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	53
Personal watercraft (i.e. sea-doo):	70.21% 33	27.66% 13	2.13% 1	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	47
Non-motorized watercraft (i.e. canoe, kayak, paddle boat, paddle board, etc.):	16.20% 29	27.37% 49	21.79% 39	14.53% 26	10.61% 19	6.15% 11	2.79% 5	0.00% 0	0.00% 0	0.56% 1	179

#	OTHER (PLEASE SPECIFY)	DATE
1	None	8/30/2022 10:04 PM
2	Pontoon boat	8/30/2022 7:34 AM
3	Pontoon qty-1	8/26/2022 3:55 PM
4	One pontoon boat	8/26/2022 1:39 PM
5	Pontoon	8/26/2022 1:17 PM
6	None of the above	8/24/2022 10:44 AM
7	Pontoon	8/22/2022 1:03 PM
8	Kayaks	8/17/2022 8:01 PM
9	1 small fishing boat and ski boat...	8/16/2022 5:16 PM
10	Pontoon	8/13/2022 8:51 PM
11	1 Pontoon boat	8/8/2022 4:59 PM
12	ONE PONTOON	8/8/2022 9:32 AM
13	22 ft Pontoon boat with 60HP motor	8/8/2022 6:35 AM
14	Pontoon boat	8/2/2022 9:32 PM
15	135 hp	8/2/2022 9:13 AM
16	Medium motor boat is a21' pontoon	8/1/2022 11:33 PM

Q14 14. What recreational activities do you or those staying at your property take part in? (Please check all that apply)

Answered: 241 Skipped: 8



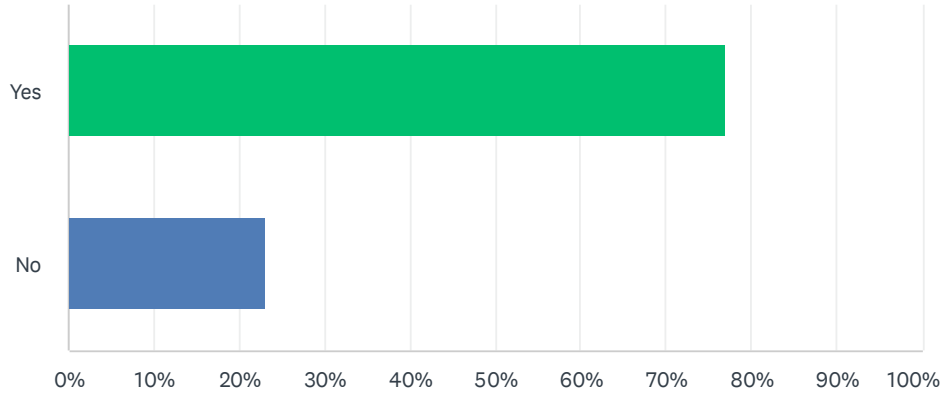
Big Shell Lake Capacity Study Survey

ANSWER CHOICES	RESPONSES	
N/A	1.24%	3
Beach activities	62.24%	150
Fishing	81.33%	196
Swimming	83.40%	201
Boating	90.46%	218
Pickleball	25.31%	61
ATV'ing	54.36%	131
Nature hikes	49.38%	119
Ice fishing	56.85%	137
Hunting	15.77%	38
Snowmobiling	58.09%	140
Motorized water sports	59.34%	143
Non-motorized water sports	59.75%	144
Other (please specify)	4.98%	12
Total Respondents: 241		

#	OTHER (PLEASE SPECIFY)	DATE
1	Golf	8/31/2022 7:46 PM
2	Sailing	8/26/2022 8:10 PM
3	Cross Country Skiing and skating	8/26/2022 1:22 PM
4	Bring horses occasionally to graze	8/17/2022 1:59 PM
5	Saskatoon berry picking/mushroom foraging	8/15/2022 4:12 PM
6	Cross country skiing	8/15/2022 7:45 AM
7	disc golf	8/11/2022 1:02 PM
8	Disc golf	8/10/2022 5:06 PM
9	Disk golf	8/10/2022 2:17 PM
10	Xcountry skiing	8/10/2022 6:36 AM
11	Just Relaxing & enjoying the outdoors	8/9/2022 11:09 AM
12	Walking, berry picking, bird watching, reading and socialize	8/2/2022 10:48 AM

Q15 15. Do you have any concerns related to development surrounding Big Shell Lake? (i.e. scale of developments, proximity of new construction to the lake, use of landscaping materials, etc.)

Answered: 226 Skipped: 23



ANSWER CHOICES	RESPONSES	
Yes	76.99%	174
No	23.01%	52
TOTAL		226

Q16 If yes, please provide a description of the development concerns and impact:

Answered: 163 Skipped: 86

#	RESPONSES	DATE
1	Entire new developments within the past 5 years. Promise made for no modification to shoreline, but what we see are many docks and boat lifts in front of the new properties. Concern more developments will be similar.	8/31/2022 7:59 PM
2	Erosion of lake front property from wake boats. Many of us are applying for permits and paying big money to fix it.	8/31/2022 7:48 PM
3	Fishing will be greatly affected by more docks being installed around the lake.	8/31/2022 7:39 PM
4	Development of more cabins /campgrounds around the lake results in erosion of shoreline and disturbance of nesting areas.	8/31/2022 1:58 PM
5	Our lake is already over populated. The reason we have a cabin is to escape the busyness of the city and enjoy nature. The lake is noisier, busier and there is less natural lake front than there was when we began coming to the lake.	8/30/2022 10:46 PM
6	Concerned about over population of lake properties & increased traffic on the lake & roads.	8/30/2022 10:21 PM
7	several large seasonal campgrounds in close proximity of the lake have made it very busy with boats. And also stop any more development of resorts areas on the lake.	8/30/2022 10:11 PM
8	Do not want more cabins or stores	8/30/2022 6:49 PM
9	Those cabins that have never pumped out their sewer tanks, wake board boats that disturb the ecosystem of the lake because of the downward wake stirring up debris from bottom of lake	8/30/2022 3:29 PM
10	We do not wish to see any more development.	8/30/2022 9:00 AM
11	More cabins on a small lake = too much lake traffic	8/30/2022 7:39 AM
12	It's getting to busy	8/29/2022 11:22 AM
13	There needs to be an established limit to the amount and type of development that can occur at the lake. It seem like every year there are more lots or camp/trailer sites being developed around the lake. This can not continue without causing serious harm to the lake, the water and the environment (we may be there already). Years ago a report had been developed that suggested that the capacity for development had already been reach and no further development should occur. Yet more development was allowed. Seems like every time a line is drawn a few years later someone else is allowed to step over that line. So here we are again TALKING about concerns for the lake environment or allowing yet more development. I think it is time for firm limits to be established and the environment be protected for future generations. These can not just words it has to be actions.	8/29/2022 10:12 AM
14	Large homes potentially taking water from the lake. Heavy boat usage. Fuel spills. Heavy grooming of the shoreline. Leaking sewage tanks (Some cabins never get Sanitation Services.). Don't like the ugly green algae.	8/28/2022 11:46 PM
15	Volume of new developments around the lake.	8/28/2022 3:52 PM
16	It would be disappointing to see more cabin communities developed/expanded around the lake. The natural beauty of this area is what makes it special. While some development creates accessibility and allows society to enjoy it, there should be an eye on balance and harmony between natural and developed spaces.	8/28/2022 12:52 PM
17	We have significant concerns about the volume of large boats on the lake. This is becoming increasingly problematic in the last 5 years. This is clearly impacting the shoreline, the environment and safety.	8/28/2022 12:42 PM

Big Shell Lake Capacity Study Survey

18	All new development	8/28/2022 10:35 AM
19	To many people for the size of lake	8/27/2022 7:45 PM
20	The newer shoreline developments do not seem to have caused much change to lake use. The cabin owners seem to use the lake fairly consistently over the summer. The only times I avoid lake use if possible is on weekends - especially long weekends. I would be interested to know how many of those using the private campgrounds in the area use the lake. At times there are numerous boat trailers in the parking area near the boat launch in Echo Bay and I've heard anecdotal reports of people camping in the boat trailer parking area while fishing for a weekend.	8/27/2022 5:19 PM
21	Getting to be too many cabins and boats	8/27/2022 4:35 PM
22	Over developed	8/27/2022 12:42 PM
23	Lake shore has been over developed. Chemically treated wood or other products should not be allowed on/ near lakeshore	8/27/2022 12:20 PM
24	I would be interested to know the development per foot of lakefront, as it seems there are more than enough cabins already. We must be careful and not overload the lake with people, boats, etc.	8/27/2022 11:22 AM
25	part of our attraction to Big Shell Lake was how there is not alot of lake traffic on the water.	8/27/2022 9:34 AM
26	The wake from large boats has eroded 10 feet of our shoreline within the last 5 years.	8/26/2022 8:15 PM
27	Increased volume of motorized equipment. Noise and environment pollution. Reduced wildlife. Increased danger to non-motorized users.Shore pollution due to cut underwater plants rotting on shorelines. Increased use of motorized equipment by underage, untrained drivers both on and off the water. Noise from construction and equipment. Deforestation of construction areas. Loss of habitat.	8/26/2022 7:52 PM
28	We feel the lake is becoming over populated for the size of the lake and would not like to see further development.	8/26/2022 5:52 PM
29	The lake already has more development than it can handle.	8/26/2022 5:03 PM
30	Over development	8/26/2022 5:01 PM
31	We feel lake is overdeveloped as it is	8/26/2022 4:44 PM
32	Over development	8/26/2022 4:35 PM
33	No new developments wanted. No new campgrounds in the area. Lake has reached or exceeded its capacity.	8/26/2022 4:01 PM
34	The more people, the more watercraft and the more the shoreline erodes. It sometimes gets too busy and scary for swimmers and non-motorized water craft. I worry about the shoreline animals. I heard there were very few baby loons born this year on the lake because the high waves from wakeboards wrecked the nests. I am not sure if that is true but I do know that we did not see one baby loon on the lake this summer.	8/26/2022 2:56 PM
35	I believe that considering the size of the lake that there enough cabins around the lake	8/26/2022 2:39 PM
36	The previous Lake commissioned studies indicated no more lake shore development was advised for the Big Shell Lake . Sadly, that valued advice was ignored. Don't see why another study won't be ignored. I believe we are vastly over developing the resource.	8/26/2022 1:57 PM
37	All new construction in new areas is extensive, lasting for 2 or 3 summers. Construction vehicles tear up the roads.	8/26/2022 1:50 PM
38	Concern of too much traffic on the lake	8/26/2022 1:31 PM
39	over population of lake, causing shoreline erosion and water contamination/pollution	8/26/2022 12:51 PM
40	Wakeboard boats damaging the shore. It's obvious !	8/26/2022 12:44 PM
41	I have owned the lot for approx. 40 years - built the cabin which is also my retirement home 15 years ago - before that was a camper and at my parents before that whom have been on the lake since the 1950's - I was born on the lake and have seen all the development and still recall what it was like when my Dad cut a trail into Echo Bay back in the 1950;s- I have seen mine and the neighbors shoreline erode and have lost 6 feet or more in the past decade alone -	8/25/2022 2:59 PM

Big Shell Lake Capacity Study Survey

every year the shore creeps more into the tree line - this is a result of large surf waves driven by wind and wake boats. I don't have a problem with the wake boats - my issue is I cannot even so much as cut a blade of grass or put stones along the shore to keep it from eroding more. The end of the lake I am at basically turns into an algae invested swamp land in the summer - I suspect because of nitrogen in the water from what I suspect is over development - when is it going to end is what i would wish to know - in my youth it was totally prestine - echo bay and the RV of Shell Lake is now a congested mess with everyone living on top of each other. The lake is already over developed on the south - there should be no more.

42	Close proximity to the lake	8/25/2022 7:27 AM
43	Lakeside lawns and addition of fertilizers. Encroachment of farmland and the removal of forest.	8/24/2022 5:25 PM
44	concern re: the number of boats we see on the lake, fast drivers, alcohol on the boats, more people means more boats	8/24/2022 1:38 PM
45	I believe this lake can not withstand any more development. Our lake is being damaged by large boats that damage the lake bed.	8/24/2022 8:01 AM
46	Big boats destroying the shoreline.	8/23/2022 7:57 PM
47	Our main concern is the strick rules created for the last development at Aspen Ridge, as they were explained to us at a town hall meeting in Spiritwood prior to the development going ahead, which were never enforced. i.e. no marina as was suppose to be provided because no boat lifts in front of cottages were to be allowed.	8/23/2022 4:34 PM
48	The Big Shell Lake Fish Habitat Assessment from 1996 said the "level of development at Shell Lake is very high". It also said "Further development at Big Shell Lake is not recommended, and the natural condition of the 13 km of undeveloped shoreland should be preserved." Since this assessment, there have been new developments on the lake. In addition, there has been increased traffic from the trailer parks nearby. This has caused the lake and public beach to become crowded in recent years. If there is any further development at the lake or nearby, we feel the lake will be too crowded, and it will have a negative impact on those who already use and enjoy the lake.	8/22/2022 11:47 PM
49	The lake is a fairly small lake and is very busy during summer months on the water with the number of boats and personal water crafts. We are also concerned with the overall health of the lake as it pertains to fish and other wildlife. Additional development will only add to this concern.	8/22/2022 9:53 PM
50	Extra traffic has detrimental effects on our roads. The resort villages do not pay taxes to the RM. This leaves the local ratepayers having to subsidize the road work caused by residents of the resort villages.	8/22/2022 4:59 PM
51	Noise, dust, overpopulated	8/22/2022 2:38 PM
52	The lake is busy enough without allowing more development. Taxes will go up for roads/ snow removal/ garbage bins. Etc.	8/22/2022 1:12 PM
53	Settlements	8/22/2022 9:44 AM
54	Too many properties for size of lake	8/21/2022 6:39 PM
55	1997 serm survey stated lake was at capacity and was more developed than Emma Lake per mile of shoreline. Since then two developments have been added which have stretched the lake beyond capacity. Another concern is the two satellite communities which add stress to the lake.	8/19/2022 10:07 AM
56	To close to the lake and effects of higher density of people on surrounding farm land.	8/18/2022 10:41 AM
57	More development in the area is impacting the lake water. I see less birds every year. I don't think the lake can sustain more boats since The shorelines are eroding already.	8/18/2022 7:36 AM
58	The seasonal campsites bring a lot of extra boats and puts a lot of fishing pressure on the lake	8/17/2022 9:09 PM
59	Seems like this lake is as full as it can get according to amount of boats on the lake on long weekends	8/17/2022 4:42 PM
60	overuse of lake: habitat/trees/lakeshore/being destroyed, noise level increased with overuse, disregard for water fowl...	8/16/2022 5:36 PM

Big Shell Lake Capacity Study Survey

61	Far to much uncontrolled development in surrounding areas. Significant habitat destruction to clear access for new lots or cabins. Appears that the municipality is more interested in securing a larger tax base than preserving the environmental health of Big Shell lake and the surrounding area. If this continued level of development continues to erode the quality of the lake and area we are seriously considering moving to a better location.	8/16/2022 3:33 PM
62	With the increased size of cabins and frequent renovations I'm concerned with waste management of materials. We've had dumping in our land in the past.	8/16/2022 3:14 PM
63	Too many new dwellings	8/16/2022 12:12 PM
64	I'm concerned about the number of cabins that significantly alter their shorelines (bringing in new sand, removing weeds, building rock walls, etc.) as this destroys the growing habitats for a number of fish species. We'll often see small perch and jack fish, along with other minnows and tadpoles, along our weeds, so I know these are important for the lake ecosystem. I worry if more of the lake were to be developed, there would be further erosion and alterations to the shoreline that would negatively impact the wildlife. I also think this lake is very frequently used by people who just come to fish for the day, so I worry more development in close proximity will result in over-fishing.	8/15/2022 4:49 PM
65	The concern is related to the proximity of the new construction to the lake.	8/14/2022 8:19 PM
66	Environmental impact on overdevelopment of the lake	8/14/2022 12:07 AM
67	Concerned that the lake cannot support further development.	8/13/2022 11:36 AM
68	Too many boats for the size of lake.	8/13/2022 10:04 AM
69	Already too much development on or nearby! Too many campgrounds and those people think they can freely use what us tax payers pay for. They come use, abuse & drive away in a cloud of dust. Can't even walk out on the road anymore. Fools drive like crazy!	8/12/2022 9:53 PM
70	1) It seems that people who violate the rules around tampering with the shoreline can get away with it (I.e. guy who built the concrete area in front of his cabin. 2) This lake should not have any more development allowed - its a small lake and is too busy on all summer weekends, especially with all the large campgrounds and those people coming here too.	8/12/2022 9:09 PM
71	Non-permitted landscaping and other related development.	8/12/2022 6:36 PM
72	There has been a lot of new development / cabins at Big Shell Lake and therefore the lake has gotten a lot busier - more boat traffic, etc	8/12/2022 6:56 AM
73	Keep development to a minimum	8/12/2022 6:35 AM
74	Scale of construction, increased number of people using the lake, safety on the water and off the water	8/11/2022 6:44 PM
75	To many seasonal campground s bring to much boat traffic to lake and roads	8/11/2022 4:23 PM
76	I do not like to see trees surrounding the lake being cleared for cabin sites. We preserved our trees and will continue into the future. Clear cutting to create a "view" degrades the environment for everyone who enjoys the lake and decreases wildlife habitat.	8/11/2022 1:19 PM
77	I think more development stresses the environment, increases usage of the lake and puts pressure on the community in terms of road maintenance within the resort village and on county roads, garbage handling, pollution, noise, etc.	8/11/2022 1:10 PM
78	More cabins will bring more surf boats and lakeshore erosion	8/11/2022 9:56 AM
79	The increased traffic on roads, use of facilities, boat launch, and the amount of boat traffic that increases on the weekends with more access being made.	8/10/2022 5:08 PM
80	I'm concerned of more development close to the water edge ,erosion of shore line	8/10/2022 3:13 PM
81	Too many cabins on lake	8/10/2022 2:19 PM
82	Water quality as new development can impact runoff into the lake and also raises the potential for ground/surface water contamination as septic systems can leak, or be improperly discharged, and general property maintenance practices can be more impactful than no-developed areas.	8/10/2022 1:51 PM

Big Shell Lake Capacity Study Survey

83	About 15 years ago we were told we the lake was at capacity then. RM still developed aspen ridge and sun? (Don't remember the name) west side of lake south of camp ground.	8/10/2022 6:36 AM
84	Traffic has increased dramatically since trailer parks opened around the lake, new builds that have altered the shoreline/lake front and the amount of new developments.	8/9/2022 11:39 PM
85	Already a lot of cabins on the lake	8/9/2022 9:10 PM
86	The lake is already overdeveloped and used by non-residents for its size.	8/9/2022 6:58 PM
87	Lake is getting too busy	8/9/2022 6:26 PM
88	Development growth impacting condition of road, amount of dust	8/9/2022 2:56 PM
89	shoreline protection, clearing of natural vegetation, maintenance of roadways	8/9/2022 12:01 PM
90	Way to many Cabins for the size of the Lake. The Municipality of Spiritwood appears to be most willing to issue Building Permits for Cabin Developments around the Lake.	8/9/2022 11:31 AM
91	I am concerned about the overpopulation of our lake for the size that it is. I know that there are other camp grounds developed and being developed and they all use the lakes.	8/9/2022 7:37 AM
92	Lake way to busy now. Please no more develment	8/8/2022 10:23 PM
93	In the 13 years that we have owned our cabin, the lake has more weeds/algae growth. Also, the number of boats has increased to the point where you cannot enjoy the lake as much. Particularly on the weekends. Long weekends are so crowded that one of the wakeboard boats was swamped by another wakeboard boat last year. When the large boats come in the bay, the large waves have the potential to erode our shore.	8/8/2022 8:45 PM
94	there is enough cabins and hope there will not be more land designated for new cabins	8/8/2022 8:15 PM
95	Busyness of the lake and don't want it to like a Emma Lake etc.	8/8/2022 8:07 PM
96	Our concerns are mainly related to use of the water... the more dwellings, the more boats, and the new dwellings seem to have all the water toys plus large wake surf boats. Our lake is not large, there has to be some limit on the types and number of large wakesurf boats. I would never ban them entirely, just NO new devl't, hence limiting number of new large boats, especially wake surf boats.	8/8/2022 7:20 PM
97	Too much for lake size	8/8/2022 9:59 AM
98	We find the lake is busy enough on weekends and it would be dangerous to introduce even more traffic.	8/8/2022 9:32 AM
99	damage to riparian areas use of fertilizers on lawns near water damage to fish breeding grounds light pollution	8/8/2022 9:22 AM
100	Very congested and loud on the water with some people not following boating rules. Shore lines are getting washed of in areas of wakeboarding significantly over the years. A lot of kits under 16 driving ATVs and Golf carts in excessive speed and without proper protection gear from development to development.	8/8/2022 8:32 AM
101	Feel we have enough development around the lake for the size of the lake	8/8/2022 7:47 AM
102	We feel the lake is at its capacity for further development to happen	8/8/2022 6:39 AM
103	It's not a very big lake and don't think there should be anymore development. It's almost to busy	8/7/2022 11:57 PM
104	No more development needed on the lake	8/7/2022 9:33 PM
105	Concern for the health of the lake if too much development takes place.	8/7/2022 9:31 PM
106	I feel that there is sufficient development already	8/7/2022 9:20 PM
107	Overdevelopment impacting environment, water quality	8/7/2022 9:19 PM
108	Lake is over populated too many other off lake developments using the lake	8/7/2022 1:11 PM
109	Concerned about level of water traffic from a safety point of view	8/6/2022 10:32 PM
110	Getting to busy with too many boats	8/6/2022 4:31 PM

Big Shell Lake Capacity Study Survey

111	We want to make sure any development at Big She'll do not negatively impact the water or any other natural beauty our lake offers. Stewardship is the top priority!	8/5/2022 5:24 PM
112	One of the most recent developments in the area pertains to Aspen Ridge. Originally there was a lot of concern about the development and the impact it would have on shoreline, boat traffic, and general activity in the surrounding area. Rumors and speculation suggested that the development was approved with the notion that shorelines needed to remain natural.. That hasn't been the case. The Aspen Ridge development still has numerous lots for sale which will have an impact on the lake.	8/5/2022 9:50 AM
113	The lake is overdeveloped and the eco system can't handle the wake boats!	8/4/2022 9:40 PM
114	Over crowding	8/4/2022 8:56 PM
115	Would like that lake to remain as healthy and as taken care of as possible. Family has been at the lake for 5 generations and worry about a negative impact the development may have.	8/3/2022 10:06 PM
116	Too many properties developed results in too many people, too many boats (it is much worse now than 10 yrs ago) and too much noise!	8/3/2022 7:12 PM
117	Over population	8/3/2022 2:06 PM
118	Were a small lake that is already over loaded with cabins/people.	8/3/2022 9:37 AM
119	Don't want the lake to get too busy	8/3/2022 8:14 AM
120	Lake is already too busy	8/3/2022 6:22 AM
121	Too many new developments around the lake, all the campgrounds within 5-10 km from lake, and are lake bei g used by those campers, weekends are too busy on the lake for property owners, people driving around lake close to shore, making waves, washing water up on shorelines, causing erosion.	8/2/2022 11:15 PM
122	Concerned about overcrowding on beach and lake.	8/2/2022 10:56 PM
123	Lake is too busy, especially in long weekends . We often don't go out on the water on long weekends as we feel too dangerous . We call them weekend warriors.	8/2/2022 10:05 PM
124	Properties are getting larger so more people can gather, noisier, busier, concern for the# of fish in the lake that are being taken from the lake, more trees are being cut down around the lake.	8/2/2022 10:01 PM
125	Over development	8/2/2022 9:35 PM
126	Development on the lake has reached the maximum comfort level for the size of the body of water.	8/2/2022 9:31 PM
127	Scale	8/2/2022 9:10 PM
128	I would be concerned about camp sites that aren't permanent bc I would worry about partying/noise	8/2/2022 8:58 PM
129	If there were any further developments around the lake in regards to new lots or campgrounds, this would make the lake way too busy and would most likely cause some environmental issues down the road.	8/2/2022 8:42 PM
130	We simply like to be aware of any potential large scale developments and have a say/vote on that respective development	8/2/2022 8:41 PM
131	that the Resort will be over developed.	8/2/2022 8:41 PM
132	The lake is already way too busy. It can't handle anymore boats or people.	8/2/2022 8:29 PM
133	Starting to get over crowded	8/2/2022 8:23 PM
134	Concerned with any additional development in or around Big Shell Lake. We believe the lake is at capacity for development and any further development would be detrimental to the overall ecosystem.	8/2/2022 6:52 PM
135	This lake is over developed. Previous studies have indicated this and have been ignored. RM doesn't care, just want tax dollars. Developers are looking for more more more. Houses are	8/2/2022 6:09 PM

Big Shell Lake Capacity Study Survey

getting bigger with every new development. There are days when there are so many boats it's getting dangerous. ATV use is getting out of hand as well. Trails through every bush and field.

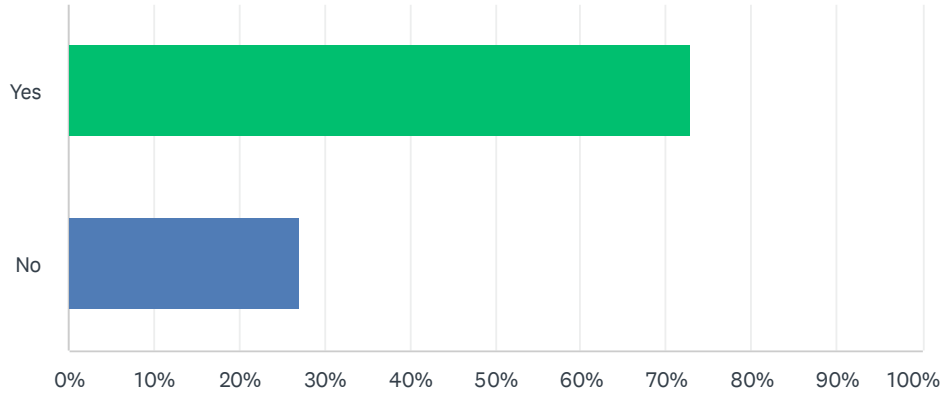
136	To much traffic on the lake and around the lake	8/2/2022 5:59 PM
137	I don't want any new developments on the lake front.	8/2/2022 5:52 PM
138	There is already differences in the lake bed along my shoreline. It used to sandy and no leeches, and now is very silty and and hard to walk out into the water without sinking to your calves. Also the amount of leeches has increased with the increase in silt.	8/2/2022 4:15 PM
139	I believe that the lake is at its capacity for development, as well as the additional visitors from the surrounding camp grounds is causing over usage of the lake.	8/2/2022 2:29 PM
140	Boat traffic on water is too busy already(safety). Impacts on aquatic life.	8/2/2022 2:22 PM
141	We are concerned with the quality and amount of water available if too many people are pulling water out of the lake for grey water usage	8/2/2022 1:15 PM
142	Damage to the ecosystem. More land clearing and tipping the balance between development and eco system. More people more bears and predators. Danger on the lake with high traffic. Traffic and infrastructure issues. The grid off the highway is a hot mess. Rumble bumps , soft spots, sink holes. Surprised that a major accident hasn't happened yet. Tax dollars don't seem to get it graded to maintain safety and yet more traffic is being considered. Not appropriate.	8/2/2022 12:35 PM
143	Additional development will cause the shoreline to deteriorate which will affect wildlife health negatively.	8/2/2022 12:21 PM
144	Over development will impact water quality and water safety. Clearing trees impacts wildlife and destroys the aesthetic quality and beauty of our village and eventually our wonderful village will be like any typical Saskatchewan village dear kid of wildlife, birds and natural plants.	8/2/2022 11:12 AM
145	Too many boats on the lake Too many non cabin owners using our lake, beach and facilities with us shouldering the cleanup and expense	8/2/2022 10:50 AM
146	Keeping the lake healthy by not destroying shore line. Providing good habitat for waterfowl and fish. No more development.	8/2/2022 10:45 AM
147	With the increase of development concerns regarding pollution of the lake	8/2/2022 10:44 AM
148	I believe the lake can't handle more boats, it's very busy for a small lake and with neighboring campsite developments , the lake gets dangerous from unqualified drivers that don't care because they don't own or maintain the village properties	8/2/2022 10:24 AM
149	We feel that the lake is at capacity	8/2/2022 10:08 AM
150	Huge increase in all types of traffic. In particular increased boats on lake and continued development of trailer parks that all seem to use only Big shell lake. Development is now all the way around the lake. Very concerned about the safety and impacts on lake. Other lakes close by are far less developed and could help bear this burden.	8/2/2022 10:03 AM
151	Several studies in the past have been commissioned that have stated " the lake has reached its capacity for development". Recently a referendum occurred in RVBS where an overwhelming majority of property owners were against any additional residential cabin development in the Resort. The current Planning Statement even states the resort is at capacity and there is to be no more development.	8/2/2022 9:54 AM
152	Properties are getting so big that they are too close to neighbors- like living in a fish bowl	8/2/2022 9:33 AM
153	We feel the lake is over its maximum amount of users. Any further development of cabins or trailer parks near this water body will not be good for the habit of fish and game.	8/2/2022 9:31 AM
154	There are enough properties occupied.	8/2/2022 9:27 AM
155	We should have a cap on new development. Given the amount of boat traffic I think it has become unsafe as well as impacting the marine life. I'm aware of farmer fields that are hosting camp sites and increasing the volume of traffic on our lake. There should be some guidelines to have our boat launching areas only accessed by cabin owners or some guidelines to stop the development of these sites. I have noticed additions to cabins being added and seem too close to the shore line.	8/2/2022 9:24 AM

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156	It is nice to have natural shoreline. I am concerned further development will take away from the unspoiled nature of Big Shell	8/2/2022 9:07 AM
157	too many boats on the lake should be cabin owners only	8/2/2022 9:06 AM
158	Can the lake and water levels handle it? Can we control the water level with more development?	8/2/2022 8:55 AM
159	Concern that the lake could be over populated with the increase of new cabin construction	8/2/2022 8:30 AM
160	Lake has enough development. Very hard on the lake with all the wake boats	8/2/2022 6:54 AM
161	I believe Big Shell has surpassed a development max capacity for lake activity, traffic, pollution and further development would lead to irreparable environmental impact.	8/1/2022 11:42 PM
162	I worry more cabins and/or more campsite development will Make our lake too busy to enjoy.	8/1/2022 10:30 PM
163	Large increase in big boats (wakesetters), larger cabins, more people using lake and area. Can the lake handle it? Access to fire and EMS in respect to growth	8/1/2022 9:19 PM

Q17 16. Do you have any concerns related to how the lake is being used?
(i.e. boat traffic, water quality impact, fishing capacity, etc.)

Answered: 222 Skipped: 27



ANSWER CHOICES	RESPONSES	
Yes	72.97%	162
No	27.03%	60
TOTAL		222

Q18 If yes, please provide a description of the lake use and impact:

Answered: 154 Skipped: 95

#	RESPONSES	DATE
1	Overcrowding. Concerns for boat safety. Current state on busy summer weekends, there are many boats on the lake at one time. Concern for water quality with further modification to shoreline and cutting down of treed areas. Concern for fishing capacity and overfishing.	8/31/2022 7:59 PM
2	Many boaters are inexperienced and dangerous. There are some Airbnb cabins that have out control guests that don't care about rules. There are many boaters driving full out in the bay.	8/31/2022 7:48 PM
3	Boat traffic safety will decrease with more watercraft being regularly used. Fishing capacity will also be affected.	8/31/2022 7:39 PM
4	With more development comes more/bigger boats. These affect water quality and fish habitat.	8/31/2022 1:58 PM
5	We are concerned about the boat traffic on the natural habitat of the lake. What impact does the noise have on the animals living in and around the lake? We also do not enjoy listening to the boats on the lake. The number of boats on the lake is already excessive.	8/30/2022 10:46 PM
6	wake boats too near the shore. there should be a NO WAKE ZONE 100 meters from all shores , and in the narrow area leading into the bay	8/30/2022 10:11 PM
7	Wake boats, noise and erosion	8/30/2022 6:49 PM
8	Mostly large wake boats that must gain weight to gain a large wake	8/30/2022 3:29 PM
9	There are already numerous people that use the lake that to not contribute to the RV of Echo Bay yet they are able to use the boat launch for free. On long weekends or hot weekends there are too many boats on the lake.	8/30/2022 9:00 AM
10	See above	8/30/2022 7:39 AM
11	A large number of people use the lake. Many people whom aren't cabin owners along the lake. These are often the people whom don't respect the lake ie driving boats faster, overfishing, leaving garbage etc	8/29/2022 9:23 PM
12	To much boat traffic	8/29/2022 11:22 AM
13	We have had a cottage at Echo Bay for the past 18 years. In that time we have seen a significant increase in the number of boats on the lake. Some are fishing, some are boating, some are tubing/wake boarding. But the number of boats doesn't tell the whole story, the size of the boats has also increased dramatically. The waves generated by these boats are much greater. This we have observed over the years. I don't feel qualified to comment on the effect this significant increases in the number, size and types of boat is having on the lake, but can confirm that a major increase has occurred. I am interested in seeing a fish count (evaluation) on the lake. I believe the fish population is already in a steady decline. Perhaps a 2 fish limit should be considered. (Or tell me there are lots of fish and I just aren't as good a fisherman as I used to be)	8/29/2022 10:12 AM
14	High speed of large motor boats in Echo Bay. Number of boats on the main lake with the lack of attention to other boaters.	8/28/2022 3:52 PM
15	The speed of watercraft entering/exiting Echo Bay appears to erode the shoreline of both the mainland and the island.	8/28/2022 12:52 PM
16	The shoreline is being eroded at an alarming pace especially in the resort villages. There is a visible change in the water life and plants, including the volume of plant life impacting the quality of the water.	8/28/2022 12:42 PM
17	All of above Wake boats Shore line erosion Algir growth Water ski waje boats persoal watercraft in the residential echo bay area	8/28/2022 10:35 AM
18	Too many wake setting boats, they run too close to shore lines and stir up the bottom	8/27/2022 7:45 PM

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	wherever they go	
19	Long weekend boat traffic.	8/27/2022 5:19 PM
20	Too many big wake surfing boats	8/27/2022 4:35 PM
21	Alge that has gotten worse and worse over the years. The lake has been over fished. The shoreline is quickly eroding due to the number of boats and the speed at which that travel.	8/27/2022 12:42 PM
22	Large watercraft should be encouraged to stay within the main body of the lake in order to decrease the erosion of the shore.	8/27/2022 12:20 PM
23	Boat traffic has increased significantly. Even though it's not legal, many operators drive boats fast near the shore. I'm worried that more cabins = more boats = more disruption of nature.	8/27/2022 11:22 AM
24	i see increased traffic on long weekends from non residents because of our close proximity to Saskatoon.	8/27/2022 9:34 AM
25	The amount of fish available appears to have been reduced.	8/26/2022 8:15 PM
26	Just want to limit new cabin construction	8/26/2022 7:56 PM
27	See above (15)	8/26/2022 7:52 PM
28	The use of wake boats has eroded the shore line to a great extent and should not be allowed. Also the use of the Bay area for experienced water skiers can be a problem and dangerous for the ones using paddle boards and canoes.	8/26/2022 5:03 PM
29	Over use	8/26/2022 5:01 PM
30	Wake board boats are ruining the shores and are turning up the water	8/26/2022 4:35 PM
31	Water quality: Weeds are growing rapidly.	8/26/2022 4:01 PM
32	Not at present, but obviously that will change with more development	8/26/2022 2:53 PM
33	Wake boats, think they are killing the baby loons. No births in last two years	8/26/2022 2:35 PM
34	There is more and more boat traffic every year and fewer fish are available for catching.	8/26/2022 2:05 PM
35	Too much lake shore development .	8/26/2022 1:57 PM
36	Increased activity/traffic on the lake. Increasing concern for water safety. Effect on the fishery capacity.	8/26/2022 1:50 PM
37	Concern of too much traffic on the lake	8/26/2022 1:31 PM
38	Larger boats doing water related sports activities being too close to the shoreline. Also small personal motorized craft invading bird nesting areas	8/26/2022 1:07 PM
39	the heavy use of wake boats	8/26/2022 12:51 PM
40	At times many many boats on the lake. Many that don't have a permanent cabin on the lake but are using the lake.	8/26/2022 12:44 PM
41	Water quality - the algae blooms - as of today it is a thick matt -- we see on the north shore along Misty Grove is a result of nitrogen or other chemicals that feed algae in the lake- in the old days the Shell River ran in and out and kept the lake flushed clean- this no longer happens as we just dont see the rain and spring water that we used to. I dont mind the boat traffic - I've never witnessed anything irresponsible - its just people enjoying nature and the water- as an FYI most of it seems to be on our end over the past few years - seems the entire lake has figured out the best water is out front of Misty Grove.	8/25/2022 2:59 PM
42	Surf boats along the shoreline create large waves along the shoreline impacting erosion and water quality. Appear to be more weeds over the last few years.	8/25/2022 7:27 AM
43	water quality seems to be getting worse, more algae and blooms every year. And lots of big boats on the lake. Concerned about the impact of the big waves made by the wake boats. Washing away nests of the loons and ducks	8/24/2022 1:38 PM
44	Large boats are disrupting nesting habitat, and affecting the lake bed.	8/24/2022 8:01 AM
45	Surfing creates huge waves making it unsafe for smaller Boats and other lake activities .Long	8/23/2022 7:57 PM

Big Shell Lake Capacity Study Survey

	weekends are terribly busy	
46	Boat traffic and the Irresponsible boat owners not following boating etiquette	8/23/2022 1:46 PM
47	It is becoming increasingly rare to find a quiet night at the lake during the summer. There are often multiple boats blaring their music at unreasonably high volumes. On weekends, the boats with loud stereos often tour the lake well after dark. The vast majority of people (and wildlife) would appreciate an enforced noise bylaw. It would be pretty safe to assume that many of these loud party boats have intoxicated drivers. This is even more concerning than the noise. I have noticed that there are fewer fish and they are smaller than they used to be. I assume this is due to overfishing. I am also concerned about the erosion of shoreline due to wakeboard/surf boats. They have massive wakes that send waves crashing into the shore. Our anchor often can't hold the fishing boat in place when these waves hit the boat.	8/22/2022 11:47 PM
48	As a regular user of our boat, I would say that current traffic on the water is on the upper limit of what I would consider safe. We have several friends at other lakes such as Emma Lake who tell us that they don't take their boats out after 10am because it is unsafe to boat. We do not want to see Big Shell get anywhere near that type of situation.	8/22/2022 9:53 PM
49	The wake board boats steer up a lot of sediment and weeds causing poorer water quality.	8/22/2022 4:59 PM
50	Too many large boats, very hard on shoreline	8/22/2022 2:38 PM
51	There are non- cabin owners using the boat launch and holding up traffic at the dock.	8/22/2022 1:12 PM
52	Any kind of water and land abuse	8/22/2022 9:44 AM
53	Traffic on lake in summer is dangerous too many boats	8/21/2022 6:39 PM
54	Wake board boats are too large for our lake. There should be a restriction on the size of boat and engine allowed on our lake.	8/19/2022 10:07 AM
55	large boats disrupting lake bottom	8/19/2022 6:59 AM
56	Boats that create wakes that cause shore erosion	8/18/2022 10:41 AM
57	The wake boats cause disruption to shorelines. This impacts nesting birds. The lake isn't big enough for all the boats.	8/18/2022 7:36 AM
58	Overfishing	8/17/2022 9:09 PM
59	Surf boats need to stay away from shorelines.	8/17/2022 4:42 PM
60	Get rid of these large wake boats . After busy weekends the lake is dirty with debris , fishing is slow if any . Murky dark water .	8/17/2022 11:56 AM
61	Maintaining good water quality, fish stock. Grave concerns water fowl chased with boats...disregard for habitat, trees, shoreline.	8/16/2022 5:36 PM
62	Wake boats should be banned from the lake. They are causing extreme disruption and destruction of shoreline habitat. We have witnessed several bird nesting areas and nests destroyed by wake boat activity. High horsepower/high speed boats and Sea Doos (or similar craft) should be only allowed to operate in specified areas in the center of the lake and never closer than 750 meters from any shoreline.	8/16/2022 3:33 PM
63	Boat traffic is crazy in the summer. Size of wake boats and the wakes they produce and the impact on nesting water fowl is a concern.	8/16/2022 3:14 PM
64	There is significant boat traffic on the lake, especially on the weekends and I worry about the impact this has on the local wildlife. During the weekdays we often see a wide diversity of wildlife that is absent on the weekends, likely scared away by the noise of the cabins and boats. Specifically, we often see loons, ducks, pelicans during the weekdays but not on the weekends.	8/15/2022 4:49 PM
65	The concern is related to the ecological impact of the increased number of large residential homes thereby increasing the human footprint and the related concern of the water quality, fishing, and the sustainability of the area as a result of these long term changes.	8/14/2022 8:19 PM
66	The lake is very busy with all types of boats. The big wake boats make huge waves that go on forever and destroy the shoreline and any habitat that lives on or close to shore (ie loons).	8/14/2022 7:46 PM

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People who are fishing get bounced around by the big boat waves and or people anchored and swimming are in danger of being hit by big boats.

67	Always concerned with the use and policing of wake boats due to their potential erosion of the shoreline	8/14/2022 12:07 AM
68	Boat traffic is a concern	8/13/2022 11:36 AM
69	The number, size and type of boat usage is affecting the shorebird population and the shoreline (I only spotted 2 baby loons this summer).	8/13/2022 10:04 AM
70	Too many boats that don't belong to tax payers! They just come and think they can use everything!	8/12/2022 9:53 PM
71	Lake is sometimes quite busy with motor boats. Generally motor boats are courteous to paddlers.	8/12/2022 6:36 PM
72	There is a lot more boat traffic on the lake now than there was 5 - 10 years ago. Its more dangerous on a busy weekend	8/12/2022 6:56 AM
73	Getting to be too many boats on water in suMmer	8/12/2022 6:35 AM
74	Boat traffic, safety on and off the lake, increased pollution, water quality	8/11/2022 6:44 PM
75	I drive a surf boat. I try stay in areas with natural rocky shores. I see some drivers being more careless. Also, maybe we should look at limiting the size of boats on the lake to reduce the size of surf waves.	8/11/2022 1:19 PM
76	From a safety standpoint I think the number of boats on our lake is dangerously high.	8/11/2022 1:10 PM
77	Sunny days result in an excess of boating activity. Pontoon boats tour too close to shore. Marsh area west of Echo Bay should be a no motor zone.	8/11/2022 9:56 AM
78	Erosion of shore line with more wave activity more lake activity The lake being fished out	8/10/2022 3:13 PM
79	Too many boats and fishing which makes it dangerous	8/10/2022 2:19 PM
80	Lake safety with increased boating activity is noticeable and concerning. Shoreline erosion from large wake boats is also concerning and visible as the two islands in the big lake have eroded significantly over the past 7 years. An increase in the amount of lake garbage from boaters is also noticeable with can, cigarette butts and other plastic type products being noticeable along shorelines and in the middle of waterbodies.	8/10/2022 1:51 PM
81	Large wake boats, ones that have props angled down are harming the bottom of the lake, the turbulence is churning up the aquatic life. Fishing, people are taking everything caught. Our fish are depleted. We desperately need restock walleye, large perch.	8/10/2022 6:36 AM
82	Water quality, too much boat traffic & too many surfing boats causing huge waves that are eroding the shore line & destroying the three small islands	8/9/2022 11:39 PM
83	Some weekends are extremely busy with boat traffic and safety is often a concern.	8/9/2022 6:58 PM
84	All of the above	8/9/2022 6:26 PM
85	Small lake for the amount of boat traffic, lots of waves coming to shore, boats close to paddle boards	8/9/2022 2:56 PM
86	fishing capacity, boat traffic and specifically wake size in close proximity to shorelines	8/9/2022 12:01 PM
87	To many big Wake Boats & Seadoes in the waters of Echo Bay. But I realize the Village Council and Municipal Authorities have no jurisdiction or Authority over the water in the Lake, which apparently comes under Federal Jurisdiction.	8/9/2022 11:31 AM
88	see previous answer.	8/8/2022 8:45 PM
89	We feel there is enough boat traffic now and hope there is no more new development, no more land designated for new cabins	8/8/2022 8:15 PM
90	Not at present	8/8/2022 8:07 PM
91	The lake is at capacity, no new devl't.	8/8/2022 7:20 PM

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92	We're always concerned, however we have nothing to report.	8/8/2022 1:17 PM
93	Wakeboard boats should be in the middle of the lake. Their wake causes land erosion Fertilizer from the surrounding fields causing excessive vegetation in the lake water Minors driving jet skis or seadoos are a danger, as they are reckless and unaware	8/8/2022 11:08 AM
94	Pulling skiers and tubes should not be allowed.	8/8/2022 10:06 AM
95	Wake Boats.	8/8/2022 9:59 AM
96	Tubing should be considered the same as wake surfing and can be done in the big lake but not the smaller echo Bay Area. Unless driving in a predictable line to come or go from home base.	8/8/2022 9:32 AM
97	the lake is eutrophic and more people at the lake will lead to more nutrient entering the lake.	8/8/2022 9:22 AM
98	Overfishing happening already due to the current populations and visitors, wakeboarding adds to the shore corrosion as people ignore rules including in the bay area.	8/8/2022 8:32 AM
99	Would like to see no wake zones close to shores. It is great that we can enjoy our wake boats, but with that comes a responsibility to maintain shore lines and shore property	8/8/2022 7:47 AM
100	The large ski boats are destroying the shoreline with the large waves caused by their wakes	8/8/2022 6:39 AM
101	I think the fishing is not like it used to be 20 years ago. So you wonder if the additional people have hindered the fishing	8/7/2022 11:57 PM
102	New to the lake don't understand how to utilize the bay. Driving boats in the wrong direction in the bay and driving too close to the shore.	8/7/2022 9:33 PM
103	We have been at the lake for 19 years. With increased development on and around the lake over the past 19 years, the heavy boat traffic at busy times of the year is a huge problem. On many weekends and particularly the long weekends there is way too much boat traffic to feel safe on the lake. It is just about impossible to enjoy any recreational activities on the water during the busy times.	8/7/2022 9:33 PM
104	Boat traffic high especially with the high end boats	8/7/2022 9:20 PM
105	Boat traffic	8/7/2022 1:11 PM
106	There seems to be less fish in the lake and they are generally very small young fish.	8/7/2022 9:38 AM
107	More development equals more boat traffic	8/6/2022 10:32 PM
108	Water quality it's near as good as in past	8/6/2022 4:31 PM
109	Lake gets pretty green sometimes.	8/5/2022 10:32 PM
110	Boat traffic can be significant at times.	8/5/2022 9:50 AM
111	There is to many boats on the lake, the wake boats are destroying the ecosystem, the weed/reed beds in places that there never was, the lake is so stirred up.. have been here for over 25 years and the change to the natural lake environment is completely disturbed and changed from what it was.	8/4/2022 9:40 PM
112	Boat traffic, water quality	8/4/2022 3:35 PM
113	At this time I believe lake use is sustainable but worry in future it may not be. Emma and Candle Lake are unbelievably busy and must have huge affect on the lake itself.	8/3/2022 10:06 PM
114	The noise from personal watercraft as well as wakeboats has grown a lot	8/3/2022 7:12 PM
115	Too many high powered watercraft for size of lake	8/3/2022 2:06 PM
116	At times the lake is overwhelmed with boats to the point it's not safe.	8/3/2022 9:37 AM
117	Don't want the lake to get too busy	8/3/2022 8:14 AM
118	Too many wake boats	8/3/2022 6:22 AM
119	As above.	8/2/2022 11:15 PM
120	Boat traffic can be very heavy during summer weekends. Worried about collisions/boating accidents.	8/2/2022 10:56 PM

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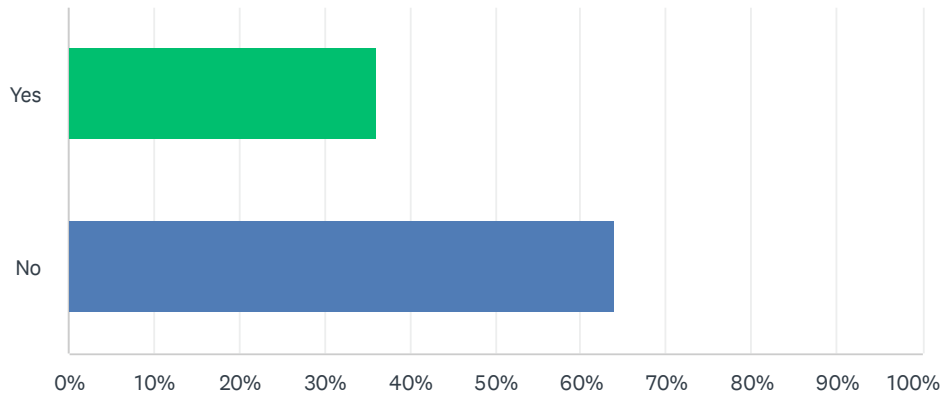
121	Fishing is poorer since boat traffic increased. Wake boats are damaging the shore line. As above, long weekends are particularly busy on the lake and I feel strongly that it's dangerous to be on the lake. One instance, we were in the paddle boat and a motor boat was coming toward us with the hull up: didn't see us, we got up and waved and were ready to jump : went by a foot from us and looked surprised when he looked back and saw us.	8/2/2022 10:05 PM
122	More big boats, some people with pontoons, motorboats, jet skis so busier and noisier, bound to affect the water quality and fishing capacity.	8/2/2022 10:01 PM
123	Shore line washing with large boats	8/2/2022 9:35 PM
124	Boat traffic, fishing	8/2/2022 9:10 PM
125	All boat owners that are launching their boat in the water should have to pay a tax for solely that purpose.	8/2/2022 8:41 PM
126	Too many surf boats on the water	8/2/2022 8:29 PM
127	Starting to get over crowded	8/2/2022 8:23 PM
128	No concerns but would be nice if the lake were stocked for walleye	8/2/2022 6:52 PM
129	Even on calm days the water is full of waves from constant boats, tubes and wake boards.	8/2/2022 6:09 PM
130	Traffic around and on the lake	8/2/2022 5:59 PM
131	I would like to see no wake boats allowed as they stir up a lot of sediment from the bottom of the lake.	8/2/2022 5:52 PM
132	The large surf and wake boats are stirring the bottom of the lake up, and causes large waves coming into shore even when they are 400yards away from my cabin. The waves are much larger than when we have storms with strong winds. I think there should be investigation of the depths of water needed to run these boats, and the disturbance depth. Also many of them are coming in to less than 100 yards away from the shorelines, where it's only about 20 feet.	8/2/2022 4:15 PM
133	I would like to see more accountability of limits on fishing as well as the impact for large wakesurf boats on the shoreline.	8/2/2022 2:29 PM
134	Boat traffic.	8/2/2022 2:22 PM
135	We are concerned that too much boat traffic and exhaust will be put in the water and affect the fish/water habitats	8/2/2022 1:15 PM
136	Yes as stated in previous answer, ecosystem damage. Boat traffic and accidents etc	8/2/2022 12:35 PM
137	Boat traffic will increase inevitably, big shell already has many boats on water that do not contribute to village tax base. Trailers at seasonal lots should already be paying to access our waters. We do not need extra traffic on the lake.	8/2/2022 12:21 PM
138	If development continues water safety will eventually be an issue	8/2/2022 11:12 AM
139	Too many boats on lake Cabin owners filling in ponds to enable them to use them as parking space no regard for wild life	8/2/2022 10:50 AM
140	So far fairly good. Concern with over population, use of jet skis and aggressive boaters.	8/2/2022 10:45 AM
141	The jet skis are very loud and rip up the lake, most drivers don't care about the fishing aspect of the lake and don't respect other boats, most are not property owners at the lake, but a few are	8/2/2022 10:24 AM
142	Traffic on the lake at times can be quite busy	8/2/2022 10:08 AM
143	Huge increase in all types of boats. This affects water quality, safety, fishing and tax payers enjoyment of a lake retreat.	8/2/2022 10:03 AM
144	RVBS is a private development. Rate payers have a vested interest in the viability and sustainability for generations to come. Over the past few years there has been an increase in traffic within our community, wear and tear on our infrastructure and use of our resources by non property owners at the expense of property owners. Somehow, our current council(s) and other resort councils needs to find a direction to take to head this. Property owners have to stop paying for others vacation at their expense.	8/2/2022 9:54 AM
145	Large boats are coming in too close to shoreline. Wave action is causing issues on the	8/2/2022 9:33 AM

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	shoreline	
146	Size and noise from the ski boats and sea-doods. I fear that they are contributing to erosion of the shore too much.	8/2/2022 9:32 AM
147	We feel the lake is over its maximum amount of users. The lake is always rough and at times unsafe due wakeboard boats creating waves from all directions. And the amount of water traffic. And the shorelines are seeing the effects.	8/2/2022 9:31 AM
148	Heavy boating ,	8/2/2022 9:27 AM
149	The boat traffic has increased. There should be a complete ban on seado's. They are a complete hazard to swimmers and non motorized water crafts at the shoreline. As well as causing noise pollution and are not following the guidelines for water crafts distance/speed from the shore line. I think the large wakeboarding boats are also causing issues to our water quality. There seems to be poor understanding as far as boating etiquette. Large wake boarding boats driving close at high speeds by small non motorized watercrafts and fishing boats. Echo bay is too busy and unsafe and people are not following the flow of traffic.	8/2/2022 9:24 AM
150	Currently, boat traffic seems manageable. However, I would not want it to be any busier	8/2/2022 9:07 AM
151	too many non taxpayers using village taxpayers facilities	8/2/2022 9:06 AM
152	Over use for boating of surf boats.	8/2/2022 7:49 AM
153	Wake boats hard on lake and shore line	8/2/2022 6:54 AM
154	See above.	8/1/2022 9:19 PM

Q19 17. Are you aware of any environmental concerns at Big Shell Lake?
 (i.e. pollution and dumping concerns, erosion, flooding, invasive or endangered species, etc.)

Answered: 225 Skipped: 24



ANSWER CHOICES	RESPONSES	
Yes	36.00%	81
No	64.00%	144
TOTAL		225

Q20 If yes, please provide a description of the environmental concerns and impact:

Answered: 84 Skipped: 165

#	RESPONSES	DATE
1	People dumping all sorts of garbage, some of it very large, at the clean fill sites, or anywhere there's an open space. Modification to trees and shoreline without a permit.	8/31/2022 7:59 PM
2	Mostly erosion. Rain water is eroding the property around the cabin from the top of the road to the lake front. Frontages of property is seriously being eroded from wake boats.	8/31/2022 7:48 PM
3	The wakesurf boats create bigger waves which erode shoreline. Also, there is a sailboat (with someone living on it) anchored all summer long on Big Shell Lake. Where does he dump his sewer?	8/31/2022 1:58 PM
4	The erosion of the shoreline is an on going concern with the number of boats on the lake.	8/30/2022 10:46 PM
5	shore erosion from wakes of boats	8/30/2022 10:11 PM
6	Pollution, erosion, endangering wildlife	8/30/2022 6:49 PM
7	Ongoing erosion and sewer	8/30/2022 3:29 PM
8	Garbage is found in the lake. At Aspen Ridge garbage containers are used by more people than the people at the development Possibility have garbage containers at the launch area??? Or an additional one at entrance	8/29/2022 9:23 PM
9	Wake boats causing erosion	8/29/2022 11:22 AM
10	We have noticed an increase in the amount of vegetation growth on the lake bottom. So much so we have great difficulty with our boat getting threw in may areas on the bay.	8/29/2022 10:12 AM
11	We have watched the size/diversity of the habitat/vegetation on the lake's small islands deteriorate in the past five years. Beavers are doing considerable damage to the trees and the lack of effort to preserve those shorelines makes them succceptible to erosion from boat waves. We would very much like to see these islands maintained and preserved.	8/28/2022 12:52 PM
12	Shoreline errosion North andSouth shore of evho bay	8/28/2022 10:35 AM
13	The wake setters are making biggar waves than this lake has ever seen	8/27/2022 7:45 PM
14	When water levels are high, wake boats were causing shoreline erosion.	8/27/2022 5:19 PM
15	Erosion of the banks and islands and stress on the loons and pelicans and other waterfoul	8/27/2022 4:35 PM
16	Erosion of the shoreline due to the large watercraft coming closer to shore than necessary @ high speeds	8/27/2022 12:20 PM
17	Between Bruce Ioraas and Michael Lulchak there appears to be an invasive grass. It showed up maybe 4 years ago, and I don't recognize it	8/26/2022 7:56 PM
18	Destruction of the natural shoreline and public reserve land sometimes being used for personal use.	8/26/2022 5:52 PM
19	The shoreline erosion from large boats has been a problem and noise pollution from loud speakers on boats and boats and seadoos with loud engines.	8/26/2022 5:03 PM
20	Over use	8/26/2022 5:01 PM
21	All the rocks placed around the shoeline	8/26/2022 4:35 PM
22	I am not aware of any environmental concerns, only that there were very few baby loons born on the lake.	8/26/2022 2:56 PM
23	Shoreline disturbance	8/26/2022 2:35 PM

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24	The killing of beavers and dumping carcasses to remove them from the lake area	8/26/2022 1:57 PM
25	Erosion	8/26/2022 12:44 PM
26	Nitrogen in the water- is there any - or what is the reason I am seeing the algae bloom out front of my place and along the western edge of Misty Grove Eroding Shoreline- You can see it first hand in front of my cabin - its really really bad -- what can I do to stop it from migrating more than it has? Beavers are decimating the tree lines and shorelines-- there is almost a 100% loss of the poplar forest around the entire lake and this has lead to increased shoreline erosion	8/25/2022 2:59 PM
27	Water quality	8/25/2022 7:27 AM
28	Concerns with the number of loons left at the lake, used to be more and more having families. Now we've seen loon nests washed away by waves	8/24/2022 1:38 PM
29	Not officially however it is easy to note the reduction of birds on our lake due to the noise and wave action	8/24/2022 8:01 AM
30	Our shorelines are being eroded more now than ever before. We believe the wakeboard boats are causing large waves which are damaging shores.	8/19/2022 10:07 AM
31	Erosio of shorelines. Any cabin owners are building up their shorelin withrocks and this should be mandatory.	8/18/2022 7:36 AM
32	Caragan shrubs that were planted years ago are taking over the area of the village of Big Shell at the expense of beautiful wild species such as: hazelnuts, dogwood, cranberries, chokecherries, saskatoon berries, raspberries, rose bushes, etc. all native to the area. Erosion of native habitat... some flooding...poor drainage	8/16/2022 5:36 PM
33	Wake boats cause extreme shoreline destruction. Watercraft congestion causes safety concerns and noise pollution.	8/16/2022 3:33 PM
34	We've had dumping of building materials on our land, the algae blooms are more common that they used to be, impact of loud quads and fireworks on the wildlife which inhabit conservation easement protected lands.	8/16/2022 3:14 PM
35	The frequent fireworks impact the local wildlife. Specifically, we notice a significant decline in the local pelican population after days when fireworks are set off.	8/15/2022 4:49 PM
36	We've had problems with erosion and had to convert our beach to a rocky water front because of the signification erosion that has occurred in the last 10 years.	8/14/2022 8:19 PM
37	Shore line erosion from the big wake boats	8/14/2022 7:46 PM
38	Erosion due to improper use of wake boats near the shore	8/14/2022 12:07 AM
39	Shoreline erosion	8/13/2022 11:36 AM
40	Flooding due to slow response to opening the outlet blocked by beaver dam.	8/13/2022 10:04 AM
41	Have seen transients throw trash into the bush and cans into the lake. We know what boats belong, also using our dumpsters for there trash but we have to pay. Not right	8/12/2022 9:53 PM
42	Thistles.	8/12/2022 6:36 PM
43	Surf boat wakes eroding shoreline and disturbing nesting birds	8/11/2022 4:23 PM
44	I believe the beavers are out of control without predators and are cutting too many trees.	8/11/2022 1:19 PM
45	I am not aware of this but it makes sense that when there is more people there is more pressure on the environment. Echo Bay has worked hard to manage pollution and dumping. Cabin dwellers are working with agencies to maintain their eroding shorelines as well.	8/11/2022 1:10 PM
46	I suspect that farm fertilizer is being carried into Shell Lake by spring melt and rain runoff.	8/11/2022 9:56 AM
47	I'm not aware but I do wonder if the farmers pesticide leaches into the lake. Also the beavers are very destructive and the trees will all be gone soon	8/10/2022 2:19 PM
48	Have notice an increase in the number of "rainbow shine" on the water surface from spillage of boat gas into the lake. Shoreline erosion from large wake boats is also concerning and visible as the two islands in the big lake have eroded significantly over the past 7 years. An increase	8/10/2022 1:51 PM

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in the amount of lake garbage from boaters is also noticeable with can, cigarette butts and other plastic type products being noticeable along shorelines and in the middle of waterbodies. It is my understanding there are a number of notable species that are on the Big Shell Recreation Site lands and other lands such as moose, prairie chickens, grouse, leopard frogs, grebes, gees, ducks, pelican, blue heron, badger, bear, eagle.

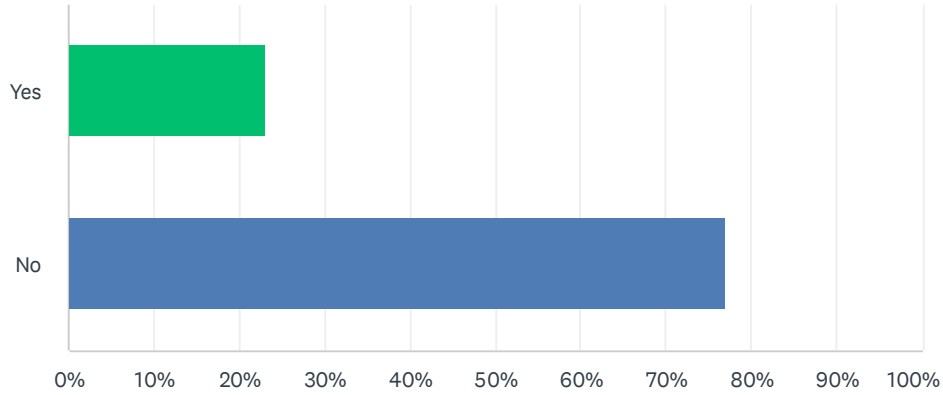
49	Shore erosion & erosion of the 3 little islands (so much smaller now) & fertilizer seeping into the lake from surrounding farm land	8/9/2022 11:39 PM
50	Shoreline erosion from the large ski boats which cause huge waves and interference with waterfowl habitats and other water related ecosystems.	8/9/2022 6:58 PM
51	Beavers,	8/9/2022 11:31 AM
52	Not aware of any	8/8/2022 7:20 PM
53	Erosion, 3 islands on the lake are eroding.	8/8/2022 11:08 AM
54	Shoreline erosion.	8/8/2022 9:59 AM
55	the possibility of zebra mussels entering the lake improper use of dump sites. the "weed dump" at Echo Bay has been improved but ineligible materials are still dumped there	8/8/2022 9:22 AM
56	whatever sulfates end up in the water from the farm fields causing significant algae blooms .	8/8/2022 8:32 AM
57	I am not sure if they are invasive, but beavers do seem to be increasing in numbers and thus taking down many trees	8/8/2022 7:47 AM
58	No but it shouldn't be so difficult to add rocks to the shore line. The proceed with your he gov is terrible	8/7/2022 11:57 PM
59	Erosion of shoreline and inability to to fix it because of rules and regulations	8/7/2022 9:42 PM
60	Excessive weeds and algae	8/7/2022 9:19 PM
61	Erosion from eversized wake boats	8/7/2022 1:11 PM
62	My shoreline is eroding. I'm planning on applying for permits to fix this in the next couple of years.	8/5/2022 10:32 PM
63	I have been coming for 25 years and I can't believe the change in the water quality, the shore line, the weed beds that are taking over the lake, the stirring up and complete desiccation of the lake.	8/4/2022 9:40 PM
64	Shoreline erosion	8/4/2022 8:56 PM
65	Erosion...water quality....decrease in natural species due to lake traffic	8/3/2022 2:06 PM
66	Erosion from wake board/surf boats; farmers draining water into the lake from their lands causing high water at inopportune times and their fertilizer affecting the weeds and algae ; fewer fish	8/2/2022 10:05 PM
67	Pollution	8/2/2022 9:10 PM
68	Shore erosion	8/2/2022 8:29 PM
69	We are concerned regarding eagle, heron, loon, pelican and other bird habitat being reduced from any further development.	8/2/2022 6:52 PM
70	Compared to even 10 years ago there is visibly more trash around the shore.	8/2/2022 6:09 PM
71	Other than the huge environmental impact of the boats, I have noticed while on walks with my leashed dog, that many feces deposits are not picked up and deposited in garbages. And I am pretty sure there is cat litter being dumped along the side of the road on the edge of the bush in a couple of places.	8/2/2022 4:15 PM
72	Out flow restrictions in the past have caused shoreline erosion concerns.	8/2/2022 2:22 PM
73	See above comments for environmental concerns	8/2/2022 1:15 PM
74	Erosion around lakefronts. Some by mother nature but much by boat traffic (wakes and waves continually)	8/2/2022 12:35 PM

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75	Ground squirrels have completely disappeared probably because of their friendly nature, traffic and our pet dogs. I haven't see a yellow headed blackbird in years and no longer see yellow warblers. I am not sure if this is due to overdevelopment or other issues, but this is a change I see. Also I no longer see wild strawberries, dew berries or wild raspberries that used to grow along the roadways. Some of this is inevitable with humans invading nature. These are a few of the things I have seen in my 35 years of summer visits.	8/2/2022 11:12 AM
76	Filling in ponds and sloughs for parking, pouring poison on weeds lake front, destroying nature for lawns/flowers	8/2/2022 10:50 AM
77	Concern this year about the absence of waterfowl.	8/2/2022 10:45 AM
78	Increased erosion allegedly due to wake boats. Garbage around natural beaches. Water quality continues to decrease allegedly due to increased activity on lake.	8/2/2022 10:03 AM
79	Residents should not be feeding animals within village limits. By doing so and having those animals become part of village life encourages less desirable animals invading. Example would be feeding deer could potentially being wolves or other animals who feed on deer into a residential setting.	8/2/2022 9:33 AM
80	See above	8/2/2022 9:32 AM
81	Shoreline erosion due to large amount of boat traffic that is creating larger than normal wakes.	8/2/2022 9:31 AM
82	Noise pollution from the seados Water issues likely with the amount of large water crafts. We have seen a significant decline in fishing over the last 20 years. We have also seen a decline in some of the wildlife in the last 20 years.	8/2/2022 9:24 AM
83	fertilizer run off from farms gas/oil spills from inattentive boaters	8/1/2022 10:47 PM
84	Beavers are out of control	8/1/2022 9:19 PM

Q21 18. Are you aware of any environmentally sensitive areas at Big Shell Lake? (i.e. wetlands, animal habitats, species at risk, heritage, or cultural resources, etc.)

Answered: 222 Skipped: 27



ANSWER CHOICES	RESPONSES	
Yes	22.97%	51
No	77.03%	171
TOTAL		222

Q22 If yes, please describe the location and type of environmentally sensitive areas that exist:

Answered: 49 Skipped: 200

#	RESPONSES	DATE
1	There's considerably fewer loons on the lake. We see very few little ones. The herons that used to nest there are not there anymore.	8/31/2022 1:58 PM
2	two small islands that are slowly being eroded away, trees are being uprooted. Also, tree damage and disappearance of the once beautiful landscape from large population of beavers	8/30/2022 10:11 PM
3	Erosion of shores where birds nest	8/30/2022 6:49 PM
4	Wildlife land/ducks unlimited	8/30/2022 3:29 PM
5	Marsh area south of boat launch is an area where birds like to nest	8/29/2022 9:23 PM
6	I do not feel qualified to properly answer this question but declining fish populations, as well as vegetation growth, may point to bigger problems with the quality of the lake.	8/29/2022 10:12 AM
7	Boat activity and resulting wakes have often destroyed loon nests.	8/26/2022 8:15 PM
8	Shoreline eroding in areas on Echo Bay	8/26/2022 5:16 PM
9	Aware that the environment has sensitive but unaware of specifics for the lake area.	8/26/2022 5:01 PM
10	Low lying islands where loons nest	8/26/2022 2:35 PM
11	My Cabin is located on the Enviromental Reserve, fish spawning grounds at Misty Grove I think it is classified as ER 4 which is the most sensitive zoning	8/25/2022 2:59 PM
12	loons, herons, becoming more rare. Nests beside the islands, kids are going on the island and messing around.	8/24/2022 1:38 PM
13	Bird nesting in all the bays and shallows along the north side of the lake.	8/24/2022 8:01 AM
14	Blue Herons don't nest there anymore.We see less waterfowl.	8/23/2022 7:57 PM
15	Creek running into the lake	8/17/2022 9:09 PM
16	wetlands, poor drainage causing major damage to existing trees. shorelines.	8/16/2022 5:36 PM
17	shoreline habitat for birds and wildlife all around the lake is not being protected; often destroyed for new cabin development. Water quality has deteriorated over the last few years. More algae blooms etc.	8/16/2022 3:33 PM
18	Our land has an easement on it because it is a critical habit for water foul, grouse, and other wild life.	8/16/2022 3:14 PM
19	We have seen golden eagles along the west side of the lake and believe they may have a nesting area along there. There are also loons that nest along the little "islands" near Echo Bay.	8/15/2022 4:49 PM
20	We noticed a decline in the number of baby loons this year.	8/14/2022 7:46 PM
21	Loon habitat	8/13/2022 11:36 AM
22	Some 3rd row people think they can just put a boat lift anywhere they want. Cut away at shoreline, haul away rocks and reeds and even cut reeds. Nothing is sacred and nobody does anything about it	8/12/2022 9:53 PM
23	West shore of lake should be protected from development	8/11/2022 4:23 PM
24	I am not aware of this but would not be surprised to learn that there are environmentally sensitive areas. I'd like to learn more.	8/11/2022 1:10 PM

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25	As mentioned the marsh area west of Echo Bay is a Loon sanctuary and fish spawning area. Personal watercraft and small boats often invade this area.	8/11/2022 9:56 AM
26	I believe there is wetlands I'm not sure we're they are	8/10/2022 3:13 PM
27	It is my understanding there are a number of notable species that are on the Big Shell Recreation Site lands and other lands surrounding the lake such as moose, prairie chickens, grouse, leopard frogs, grebes, gees, ducks, pelican, blue heron, badger, bear, eagle deer, fox.	8/10/2022 1:51 PM
28	Truly need a beaver control program, they are taking way to many trees m, muskrats are becoming bad as well.	8/10/2022 6:36 AM
29	Shoreline waterfowl nests used to be evident in the smaller bay.	8/9/2022 6:58 PM
30	I am concerened about the lagoon area at Echo Bay where the loons nest. Sometimes motorcraft go through there.	8/8/2022 8:45 PM
31	Not aware	8/8/2022 7:20 PM
32	Birch tree population is in danger because of a large population of beavers Islands could become nonexistent we	8/8/2022 11:08 AM
33	There should be no motorized watercraft activity in the shallow bay that is accessible from the far West Bank of echo bay.	8/8/2022 9:32 AM
34	Loon nesting bay	8/8/2022 9:14 AM
35	The two islands across from the Point seem to be disappearing. Also trees in the reserve on the Point seem to be suffering from something	8/8/2022 7:47 AM
36	Loon nesting grounds on the west side of the lake.	8/7/2022 9:33 PM
37	We have an Eagle and it's nest, our pelicans and other birds and animals are an important part of the lake.	8/7/2022 9:31 PM
38	beavers taking trees	8/5/2022 9:10 AM
39	Marshy areas around backwater bays	8/3/2022 2:06 PM
40	See previous answer regarding bird habitat.	8/2/2022 6:52 PM
41	A white bear	8/2/2022 5:59 PM
42	The inlet and outlet creeks	8/2/2022 5:52 PM
43	Love quading but more and more trails going through habitat areas	8/2/2022 12:35 PM
44	Only as I mentioned above	8/2/2022 11:12 AM
45	Too many boats on water destroying natural habitat and birds	8/2/2022 10:50 AM
46	No waterfowl on pond behind us this year. Mallard Cove	8/2/2022 10:45 AM
47	Associated marshlands. Creek areas that feeds the lake	8/2/2022 10:03 AM
48	I'm sure there's many. Any development on vacant land impacts flora and fauna.	8/2/2022 9:54 AM
49	Encouraging wild animals to remain within a residential setting is not a good thing.	8/2/2022 9:33 AM

Q23 19. Please share any other comments or feedback you may have regarding Big Shell Lake. If you need to get in contact with the project team, please leave your contact information (name, phone number, e-mail).

Answered: 78 Skipped: 171

#	RESPONSES	DATE
1	Given the very recent new developments on big shell lake (ie aspen ridge), should wait at least 5 more years before considering any further new developments to best understand what current state actually is given not all cabins, etc. are finished yet.	8/31/2022 7:59 PM
2	There is a camp grounds west of the lake about 15 miles away at a farmers place that will fill up on weekends. This is the biggest reason that we get so many extra boats on the lake.	8/31/2022 7:48 PM
3	I would like to know how this decision will be made. Can the existing cabin owners vote on the new development? Who will make the decision and will it be in the best interests of those looking to make more profits through taxes or of maintaining the environment as it is. [REDACTED]	8/30/2022 10:46 PM
4	If increased property development occurs, the lake becomes extremely busy & over populated. It also results in increased water pollution due to more watercraft usage & causing disruption of waterfowl habitats. It also impacts the safety of everyone using the lake during peak times.	8/30/2022 10:21 PM
5	I have just recently noticed a new graded road being built in our lake area. It appears to be accessing our lake area. It is leading from the west side grid toward the lake. I am hoping that it is not another subdivision being built on or near the lake.	8/30/2022 10:11 PM
6	In the last 5 years we have noticed more algae and much more traffic sine we purchased over 20 years ago. We chose Echo Bay due to the small size of the village but again have noticed more cabins being rented out (often with inconsiderate renters) and more and more people cabins with excessive amounts of cars and people at them.	8/30/2022 9:00 AM
7	Judging by the number of vehicles at the boat launch area in our development, many people who are not cabin owners are using the lake.	8/29/2022 9:23 PM
8	I hope people decide to make the quality of Big Shell lake the first priority by putting plans and policies in place to protect and guide the lake into the future. We recently became first time grand parents and would like our grand children to enjoy a healthy, well kept lake environment. Lets get this right for them. If I can be of any further assistance please feel free to contact me [REDACTED]	8/29/2022 10:12 AM
9	Is there anything that can be done to get rid of or reduce the algae? Is fertilizer leaching into the water to cause this? Would aeration help?	8/28/2022 11:46 PM
10	We are happy to discuss any concerns or questions about Big Shell Lake, especially having been property owners since 1976. [REDACTED]	8/28/2022 12:42 PM
11	The lake had the 'itch' this summer- even on the west side. There are usually a couple of algae blooms each year - some years worse than others. The weed growth is brutal.	8/27/2022 5:19 PM
12	There is also a lot of noise pollution with all the loud music from big speakers on the wake boats. We also have personally had our boat nearly swamped from these Huge wakes from some of these boats	8/27/2022 4:35 PM
13	A general observation. When we built in 1979 the lake was abundant with a variety of water fowl and wildlife as were all water surfaces. The decline overall is staggering. Buildings were constructed to blend in with the environment and minimally disrupt nature. Natural plants had places to thrive (some are rare) and provide cover for forest creatures. Buildings full of windows have created an increasingly dangerous hazard for forest birds. The more we build	8/26/2022 7:52 PM

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and disturb the area the more negative impact it creates. Hopefully impact studies will preserve the rich heritage that Big Shell Lake has had.

14	The council is doing a good job overseeing the resort village. That extends to the 2 people that have been hired to maintain and upkeep the development they do an excellent job, our village is well maintained.	8/26/2022 5:52 PM
15	We have had a cabin at Echo Bay since 1972 and have seen a lot of changes over the years. The Herons no longer nest here. The lake traffic has gotten much heavier as the population has increased. The Bay is small and too much traffic makes it dangerous for people to be out. We have been here full time for 14 years now and it is a very nice community.	8/26/2022 5:03 PM
16	I would like to put a travel trailer on my lot to use	8/26/2022 2:52 PM
17	As already stated, in my opinion and based on other, previous studies, the lake can only sustain a finite amount of shore development and we are past that already.	8/26/2022 1:57 PM
18	My Contact is below- feel free to call if you need any assistance - I've been on the lake for 60 years since I was born - I've seen all the development progress over the years. Im not anti development - just cautious. I think you should be looking at the watershed above the lake- in the old days the river ran in and out year round - something happens up stream that restricts water in flow which flushed out the lake. There was never an algae problem in the past like there is now Is it just lack of rain or something else effecting the inflow? [REDACTED]	8/25/2022 2:59 PM
19	The water quality seems to have deteriorated over the last few years. Thank you for this survey.	8/25/2022 7:27 AM
20	If there was rd. Access to my quarter ([REDACTED]) I am sure there would be family members that would use the said property or even build there . My email is [REDACTED]	8/24/2022 10:57 AM
21	Please contact [REDACTED]	8/23/2022 4:34 PM
22	It would be very disappointing to see further development at this lake as it would negatively impact the investment of current cabin owners and their ability to enjoy the lake under safe conditions	8/22/2022 9:53 PM
23	We need to have a no wake boat area, or just ban wakeboats from the lake period. The water gets very dirty and the shoreline is eroding.	8/22/2022 2:07 PM
24	a lot of dust off of road from traffic. this should not be just a RM concern as it is a short run from the pavement to the lake, not many accidents have ocured but quality of area could be improved by dust control	8/19/2022 6:59 AM
25	Thanks for the survey.	8/18/2022 7:36 AM
26	We are under serviced for the amount of taxes collected by the RM. we know that the council members have no interest in serving lake residents or improving our environment.	8/17/2022 8:06 PM
27	Enjoy the freedom out here. Less rules the better if not required. Nice that Big Shell has a public beach.	8/17/2022 2:02 PM
28	Would appreciate much more hiking trails, well kept, so that many can appreciate the original habitat. Have designated areas for quads away from hiking areas. Best are hiking trail, well maintained.	8/16/2022 5:36 PM
29	Yes please call [REDACTED] for further discussion. I am a P.Geo and biologist with over 40 years of environmental assessment experience. I would be willing to serve on a Big Shell Lake Management Board , should one be created by the RM to do so. Need to design and implement a Big Shell Lake environmental protection and enhancement plan that is promoted and ENFORCED. This would include limiting further cabin development and lake access. The plan also needs to incorporate a lake utilization strategy that protects the quality of the lake.	8/16/2022 3:33 PM
30	The giant quads are insanely loud and damage the road allowance trails making them impassible for some riders. There should be db limits for those things.	8/16/2022 3:14 PM
31	Property is farm land which the dump is across the road backing the property. Please advise why this survey was sent to me. [REDACTED]	8/15/2022 4:33 PM

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32	Fishing limits need to be lowered	8/14/2022 7:46 PM
33	Excellent lake and neighbours. We certainly don't want another group managing our time away! Thanks for the opportunity to participate. [REDACTED]	8/13/2022 8:56 PM
34	People set off fireworks and leave the trash. No respect for water or beach. Plus people come from away and just park wherever not caring if they block others in. They park in front of no parking signs. Supposed to be fined but nobody does so more people just keep coming.	8/12/2022 9:53 PM
35	1) no more development please. We have more than enough on this lake. 2) Rv of Big Shell needs to issue parking passes to village property owners AND/or start issuing tickets to outsiders who come here for the day and park wherever they feel like, including right in front of the no parking signs. 3) there are some new cabin owners who have dug out part of the shoreline to put their lifts and docks in at the boat launch ([REDACTED]) and to park their ATVs. No regard for the shoreline or the hill. How is this allowed?	8/12/2022 9:09 PM
36	Wouldn't like to see more development.	8/12/2022 6:36 PM
37	I feel that the lake is nearing maximum capacity - for boat traffic specifically. Lets not destroy a good thing by overpopulating our beautiful lake.	8/12/2022 6:56 AM
38	Limit development to keep lake accessible to current rate payers	8/12/2022 6:35 AM
39	Big Shell Lake is busy as it is and the shore line in places is struggling with boat traffic. (Islands in particular) Stopping additional lot development will help preserve this beautiful natural resource we have been fortunate to enjoy.	8/11/2022 1:19 PM
40	I worry about new development coming to our lake. I am concerned about the larger campgrounds that farmers have created as this has substantially increased our lake usage as well. What is stopping other farmers from developing a campground on their land to generate extra income for themselves.	8/11/2022 1:10 PM
41	Thanks for considering lake day use. Shell Lake is a wonderful recreation resource and is of course impacted by visits from area residents and in particular high density camping facilities such as Boondocks.	8/11/2022 9:56 AM
42	The increase in traffic continually erodes the gravel access road from the highway to Echo Bay. After just a small amount of rainfall it becomes quite treacherous as the gravel is constantly displaced.	8/9/2022 6:58 PM
43	The lake should be enjoyed by all SK residents, therefore access is required. Certain facilities such as beaches, boat launches and playgrounds are provided by communities around the lake and are maintained at the rate-payers' expense. Is there a mechanism to have financial input from the RM or Province to assist with the maintenance of these amenities? Can we obtain information from Fisheries and Wildlife regarding inputs to the lake on an ongoing basis? (ie. stocking with sport-fishing species)	8/9/2022 12:01 PM
44	I feel that the Underwood & Maclulan Engineering report that was done in the early 1980's should have been given more recognition.	8/9/2022 11:31 AM
45	I've been noticing that the small islands around the lake are becoming eroded more and more. It concerns me that all the trees are dying and they are getting smaller and smaller because of the bigger boats and I believe that they should somehow, somehow be preserved whether rocks are put around them or I would be open to any other options that are available.	8/9/2022 7:37 AM
46	[REDACTED]	8/8/2022 8:07 PM
47	Our one concern would be the age and stage of septic tanks and pollutant seepage from those properties with non-current tanks. Also past building materials such as railway ties still lying in and around the lake.	8/8/2022 1:17 PM
48	Shoring up the islands to prevent further erosion and loss of nesting ground for loons and geese and ducks	8/8/2022 11:08 AM
49	several studies have been done on the lake in the past. please be sure to include those in your assessment.	8/8/2022 9:22 AM
50	This is great little lake but it is getting overrun by unsustainable development.	8/8/2022 8:32 AM
51	So happy that we are addressing this situation and hope we can all work towards making our	8/8/2022 7:47 AM

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	lake a safe and thriving recreation area	
52	Feel that the large trailer parks that were allowed to happen have added a tremendous amount of people to the lake.	8/7/2022 11:57 PM
53	The lake is at capacity.	8/7/2022 9:33 PM
54	████████████████████	8/7/2022 9:16 PM
55	I'd like to know why the assessment is being done? Is it in support of new development or to curb new developments. Please feel free to send me an email at your convenience, ██████████ Thank you..	8/5/2022 9:50 AM
56	need quad trails to keep off main roads	8/5/2022 9:10 AM
57	The lake needs to impose a horsepower limit to preserve the integrity of the space.. the change in the last 25 years has been negative. What will this lake look like in 10 years?	8/4/2022 9:40 PM
58	The lake doesn't need to become over developed, over populated and busy. It is fine the way it is with current dwellings	8/4/2022 8:56 PM
59	Big Shell Lake is such an amazing and beautiful place to be as it is. Love how calm and quiet lake is most of the time and how well and healthy it seems to be. Would love for it to stay that way for my children and future generations.	8/3/2022 10:06 PM
60	Lake is too small for additional cabins	8/3/2022 6:22 AM
61	Also very concerning regarding how around the boat launch, and area when you first drive into resort of big shell, anyone can put in a boat lift and dock. It takes away the beauty of the lake, and it is not a marina, and that is why lake front cabin owners pay alot more in property taxes...	8/2/2022 11:15 PM
62	The campgrounds and new developments on and around the lake are causing a big change in the water quality. I have been here since 1987 and the detriment to the water quality and shoreline are evident .	8/2/2022 10:05 PM
63	Lake seems to be over populated already. I can't imagine another development with more boats, people etc., it's already too crowded	8/2/2022 9:33 PM
64	We are considering selling and moving to a larger lake. We have been coming to Big Shell for 35 years.	8/2/2022 8:29 PM
65	As per the previous answers we believe that Big Shell Lake is at capacity regarding development. Further development would potentially result in adverse affects on wildlife, increased boat traffic (which is currently at an acceptable level) and fishing pressure.	8/2/2022 6:52 PM
66	To many people around the lake	8/2/2022 5:59 PM
67	Major concerns with outside(out side of tax payers) usage of the lake. Surrounding camp grounds using boat launching facilities, beaches ect.	8/2/2022 2:29 PM
68	Water is very busy especially on long weekends.	8/2/2022 2:22 PM
69	We feel that the maximum capacity of big shell lake has been reached to properly sustain the fish and wildlife. There are already too many developed lots and campgrounds surrounding the lake. It is a small lake and we wish to sustain fish and wildlife	8/2/2022 1:15 PM
70	The RM is all about tax base, the lake is saturated already please use common sense and balance	8/2/2022 12:35 PM
71	Big Shell Lake is a wonderful resort village carefully managed and maintained by a council that has so far done a fantastic job of preserving its beauty while balancing issues resulting from human invasion. Just one drive thru at Aspen Ridge and you see how our village has a balance of development and nature.	8/2/2022 11:12 AM
72	The lake can't handle more development, the wake boats are damaging the weed beds and storing up the water, ivebeennoticing more weeds and the water gets dirtier sooner in the last number of years with the increase boats and water craft. Ifmoredevelopmenthappens itwill cause more damage that the lake won't recover from manypeoplethathave property enjoy thelake cause it's quiet and private, it's not candle lake , Emma, waukesha etc. That's why	8/2/2022 10:24 AM

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people are in the villages. The lake is also a volunteer run community and more demand on infrastructure, is not feasible.

73	As long time residents we are really hoping that Big SheLI does not become another overpopulated lake like EMMA. We seem to be going down that road. We need to preserve and also distribute the lake development. Money can not be the only consideration around development. Thanks for the opportunity to provide feedback.	8/2/2022 10:03 AM
74	I appreciate the survey. Every year the lake is getting busier and busier. The three additional campgrounds in the area have dramatically added to the traffic on and off the lake. Unfortunately each of the resorts on Big Shell cannot control those external sources. We as 'Shepherds of the land' can. We can inhibit any further residential development within our communities. The past referendum on lake development within RVBS spoke loud and clear. And current Planning Statements from RVBS and Echo Bay state no other residential development is to occur. Is this commissioned study a prelude to further residential development? I hope not because if it is it certainly will stir up a rats nest. Leave things the way they are. People bought properties here because they don't want a Emma Lake, Waskesui or Candle Lake! If this is the beginning to more residential development in our communities let this be a forewarning to the current Councils. Ratepayers will not be happy. There will be pushback.	8/2/2022 9:54 AM
75	My only other concern might be the fact that there seems to be little interest or leadership from council to have community activities re-activated (golf tourney, agms).	8/2/2022 9:32 AM
76	We have seen other lakes that have been over developed and chose to buy at Bigshel because at the time the watershed committee had advised no further development at this lake. BUT several developments have been pushed through. I suspect the tax revenue to the RM was the reason. Please don't let this lake become more populated than it already is.	8/2/2022 9:31 AM
77	Beautiful place for kids	8/2/2022 9:27 AM
78	Thx for doing the survey and work out into this.	8/1/2022 9:19 PM