

We would like to thank the many individuals who volunteered their time in the design and construction of the Pinawa Heritage Sundial. Without your help, this project would never have become a reality. Thank you!

We also acknowledge the contribution of the individuals and businesses that participated in the “Your Moment in Time”, “Time Capsule 2000” and “Earth~Moon~Sun~Stars” fundraising programs. The following is a list of those who contributed at the “Sun” and “Stars” levels.

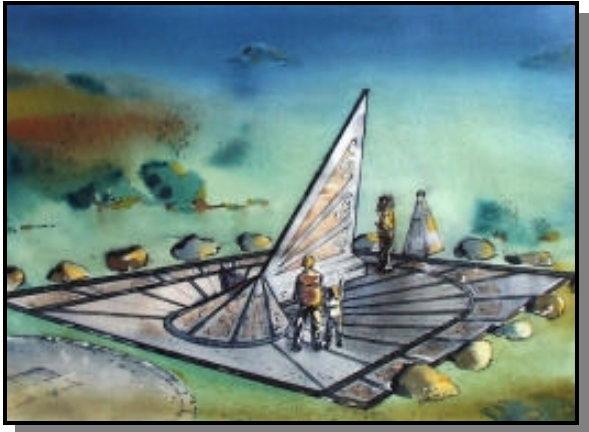
SUN
Westwood Homes Ltd. Lloyd & Susan Rattai
Osis Do-It Centre

STARS
Alice & Keith Chambers & Family
K. Barrie Burnett
Al Meisner Ltd.



PINAWA HERITAGE SUNDIAL

Latitude: 50°08'48" North
Longitude: 95°52'31" West
North American Datum — 1983



Original painting by Kathy Long.

Travel through time and discover the history of the Eastman Region as told through the images of the sundial's heritage icons.

- Time to celebrate! -

Interpretive guide

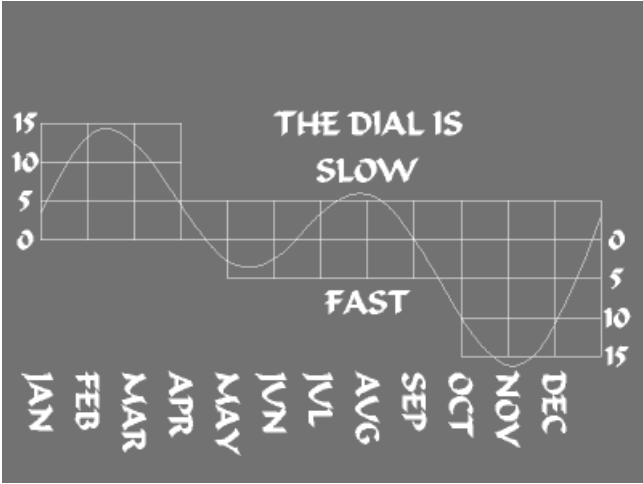
Please visit the Pinawa Heritage Sundial web site:
www.escape.ca/~sabanski

Icon images created by Flying Pigment Design Studio.
Special thanks to the following volunteers for their assistance in the preparation of this guide:
Les Crosthwaite, Roger Dutton, Jeff Long, Carl Sabanski
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How to tell the time using the sundial.

If you would like to know the “local apparent time”, the solar time as derived from the sun’s position at the sundial's location, look at the position of the shadow relative to the hour lines of the outer dial. This is sun time at the location where you are now standing.

If you would like to know the "civil" or "clock" time, which is the legally accepted time at a particular location, you must first look at the position of the shadow relative to the hour lines of the inner dial. The inner-dial hour lines show "zonal solar time", which is "local apparent time" corrected for the longitude at the sundial's location. Next, you must apply a correction from the Equation of Time. This correction is obtained from the graph below. Using the date of your visit to the sundial, obtain a value from the graph. The correction obtained is in minutes. If the value indicates that “the dial is slow”, add it to the time you obtained from the gnomon’s shadow. If the value indicates that “the dial is fast”, subtract it from the time you obtained from the gnomon’s shadow. You will now have “clock time”; that is, the time on your watch.



Graph of the “Equation of Time”.

To continue your tour of the sundial, please go to the back of the guide.

The Pinawa Heritage Sundial brings form and function together to illustrate the history of Eastern Manitoba. Form: the beauty of the sundial's creation through the efforts of local-area artists and construction experts sharing their talents. Function: the science of understanding the relationship between the earth and sun to construct a timepiece with unique characteristics for each and every location on the earth.

The Pinawa Heritage Sundial is a horizontal sundial like the kind you would find at a garden centre; however, you would not likely find one this large! The “gnomon”, the structure whose shadow points out the time of day, points to the north celestial pole, very near the north star, Polaris. The hour lines of a horizontal sundial must be designed specifically for the latitude at which the dial is located and the angle of the gnomon is equal to the local latitude.

Our sundial actually consists of two sundials on a single dial plate. It has two sets of hour lines that are used to indicate time. The outer-dial lines are designed to show "local apparent time". This is solar time as derived from the sun’s position at the sundial's location. The inner-dial lines show "zonal solar time". This is the "local apparent time" corrected for the longitude at the sundial's location. This correction is necessary because the sundial is not located on the central meridian of our time zone. Railroad track dating back to 1934 is used for the hour lines. Each 15 minute interval is marked with a small brass button.

One further correction must be applied to the reading obtained from the inner sundial to obtain "civil" or "clock" time, which is the legally accepted time at a particular location; that is, the time on your watch. This correction is known as the "Equation of Time" (EoT). The EoT value varies between +14 minutes in February to -16 minutes in November. The EoT results from two factors;



*Our father, the Sun
It is now time you
were rising
I want to dance
with you.*

— Blackfoot poem

The Day Sky
With an average of 2,000 hours of sunshine every year, Manitoba is Canada’s sunniest province, an ideal location for a sundial. The sun travels almost the same path across the sky as the moon and, on rare occasions, as was witnessed in Pinawa on February 26, 1979, the two coincide exactly, resulting in a magnificent solar eclipse.



*Around the sky
I walk
A bird
I accompany.*

— Ojibwa poem

The Night Sky
In Manitoba, the often-clear night sky reveals its wonders. At Pinawa, the moon rises in unobstructed view from across the Winnipeg River, traveling along the river's direction before setting in the west. The sundial's gnomon is aligned to true north, the direction indicated by the star Polaris, towards which the earth's rotational axis almost directly points. Sometimes, curtains of aurora borealis, the “Northern Lights”, flicker and sway across the star-studded black dome of the night - an awe-inspiring vision to the casual observer.



The Earth and Sun

*That sky over Canada is
always smiling - unbridled
nature spread to the very pole -
the green sky of summer and
the white sky of winter.*
— Andrei Voznesensky
Russian poet

The central icon on which the gnomon rests, depicts the concept of our earth surrounded by the life-sustaining rays of the sun. By astronomical standards, our sun is a rather ordinary star, a mere 1½ million kilometres in diameter. At a distance of 150 million kilometres from earth, it is now about 5 billion years old and will continue to shine for billions of years more, maintaining life and creating shadows that can be used to mark the passage of time.

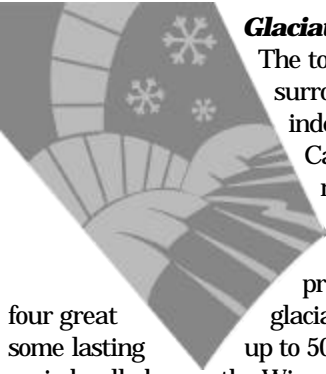
the elliptical orbit of the earth and the tilt of the earth's axis to the ecliptic. The ecliptic is the plane bounded by the orbit that the earth traces around the sun during a year.

There are two additional features to note about the sundial. The first is that the hour lines of the inner dial have been adjusted to read "Daylight Saving Time". The second is that a "noon gap" has been applied to the hour scale of the sundial to account for the finite thickness of the gnomon. Because of the gnomon's thickness, the shadow falling on the dial plate will originate from a different edge at various times of the day. Before 6:00 a.m. "local apparent time" (LAT), the shadow will be cast from the east edge of the gnomon; between 6:00 a.m. and noon LAT, the shadow will be cast from the west edge of the gnomon; between noon and 6:00 p.m. LAT, the shadow will again be cast from the east edge of the gnomon and finally after 6:00 p.m., the shadow will again be cast from the west edge of the gnomon. Noon LAT will be cast from both edges of the gnomon and, therefore, this is where the gap is applied.

There are twelve main icons etched on granite tiles that surround the base of the sundial. They illustrate the history of the Eastern Manitoba region as well as important factors that have played a role in the development of the region. Two additional icons, consisting of two granite tiles each, finish off the base on each of the left and right sides. Another four granite tiles make up the central medallion surrounding the gnomon. Images from the granite icons are echoed in the gnomon.

This brochure describes the twelve icons in chronological order, beginning with the earliest event, Glaciation, plus the three additional icons. Around the dial, the main icons are in a random, but pictorially integrated arrangement. You can enjoy discovering each icon's location, using the image next to the description.

We hope your visit to the sundial and to the rest of Pinawa will be a pleasant one.



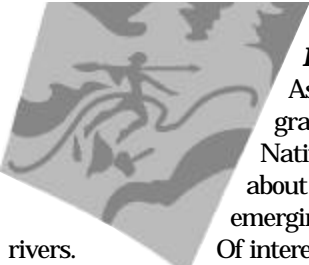
Glaciation

The topographical features surrounding Pinawa, and indeed, present within most of Canada and parts of the northern U.S., have been profoundly influenced by glaciation. Over the preceding 2.5 million years, glacial periods have occurred, up to 500,000 years. The last period, called the Wisconsinan Glaciation, lasted about 140,000 years, finally retreating about 10,000 years ago. During this time, the ice, often several kilometres thick, advanced and retreated numerous times. These repeated fluctuations left many features still visible today; for example, gravelly mounds (called “moraines”) such as Milner Ridge, the exposed and polished bedrock of the Canadian Shield and a terrain holding thousands of lakes and rivers.



Glacial Lake Agassiz

As the Wisconsinan Ice-Age glaciers finally retreated about 10,000 years ago, their meltwaters formed an enormous lake, called Lake Agassiz, that stretched across southern and central Manitoba and into Saskatchewan and Northwest Ontario, reaching depths up to 200 metres. In southern Manitoba, it deposited thick layers of silt that would contribute to the region's great soil fertility. About 8,500 years ago, the last significant portion of the lake drained into Hudson Bay. However, major remnants such as Lakes Winnipeg, Manitoba and Winnipegosis persisted. As the land surface slowly rebounds from the glaciers' weight, these lakes will continue to alter in depth and shape. With the retreat of the glaciers and their meltwater lakes, plant and animal life began to re-establish, leading eventually to the first human influx of the region – the aboriginal peoples.



First Peoples: Introduction of Stone Tools

As ancient Lake Agassiz gradually receded, the first Native people entered the region about 9,000 years ago, using the emerging network of lakes and rivers. Of interest to these hunters and gatherers were the flourishing herds of caribou and bison. Evidence of these first peoples is to be found in the numerous archaeological sites located close to Pinawa. These contain projectile points chipped from stone. Such points were attached to spears, used for hunting. Early spears were large, used in a thrusting mode at close quarters. Later, these spears were smaller and were thrown with the leveraged power of a throwing stick, called an “atlatl”.



First Peoples: Introduction of New Technologies

About 2,000 years ago, the local population greatly increased. The need to exploit every food resource prompted the introduction of new technologies. First came the canoe and the bow and arrow, which increased fishing and hunting efficiency. Wild rice was also gathered. Cooking capability was improved by the development of ceramic pots made from riverbank clay. Before hardening them on a fire, the women inscribed the pots with elegant patterns. Today, fragments of such pots are found at local archaeological sites. The form of decoration enables the pots to be dated. Such technologies persisted up to the coming of the Europeans.



The Coming of the Europeans: Voyageur Fur Traders

By 1700, the French colonists in Montreal were shipping furs back to Europe. As local fur stocks became depleted, the west was explored for new supplies. In 1738, La Vérendrye traveled as far as Lake Winnipeg. The North West Company was formed in 1784 to exploit the furs in this region. During this time, brigades of canoes, paddled by voyageurs, were regularly passing the Pinawa shoreline. Made from birch bark, each canoe was 8 metres long, paddled by 5 men, carrying 1½ tonnes. This load had to be portaged around each rapid. To bypass the huge rapids at Seven Sisters, the Pinawa Channel was used. Hence the name “Pinawa” means “calm waters”.



Industry - Agriculture, Forestry and Mining

As one moves from west to east, from the prairie to the boreal forest, there is a discernible climb in altitude. The forest has been home to a variety of industries that have taken advantage of the plentiful supplies of wood pulp, minerals and even pockets of arable soil. **Agriculture** For almost a century and a half, determined agriculturalists have been claiming available patches of land in the region to create small farms. The clayey soils here are almost identical to those found in the Red River Valley and support oilseeds, cereal crops and pasture. However, large patches of sandy soil and exposed bedrock limit fields and pastures to a much smaller size than that of prairie farms. While farmland can be found both north and east of here, this terrain represents the innermost limits of agriculture in the Shield. **Forestry** Forests make up about 26.3 million hectares of the province's 54.8-million hectare land base. The boreal forest that encompasses this region is the largest forest zone. It consists of black spruce found on the lowlands and fens, and jack pine, poplar and white spruce on the uplands. The boreal forests support the majority of the province's forest industry, providing resources for kraft paper, lumber and newsprint. **Mining** Early gold exploration at the southern boundary of the Whiteshell Park helped open up the area in the 1930s. Today, exploration continues, especially to the north of Pinawa. Mining of traditional metallic and industrial minerals such as gold, copper, nickel, granite, limestone, tyndall stone, peat, sand and gravel has been expanded to include minerals that reflect the high-tech age such as tantalum, lithium, cesium, cobalt and platinum-group elements.



Modern Transportation - Rail, Air and Road

If you were to examine the map of Manitoba you would notice a web of roads, rail lines and communities throughout the prairie. In the Precambrian Shield however, forbidding terrain has limited the development of transportation and indeed, many boreal communities still depend on winter roads and/or bush planes for access. Even where you now stand was, until 1960, equally isolated. **Rail** The first incursion into the Canadian Shield was by rail. In 1877, work began on the Canadian Pacific Railway (CPR) and by 1910, a second line belonging to the Canadian National Railway (CNR) was also operational. Locally, rail development was linked to the development of hydro-electric power along the Winnipeg River. In 1908, a short railroad was constructed from Lac du Bonnet to Pointe du Bois to allow construction and maintenance of the hydro-electric dam located there. **Air** In 1926, the Royal Canadian Air Force (RCAF) transferred their air base from Victoria Beach to Lac du Bonnet. This new location, though only a float base, provided access for forest protection surveillance, air photography and Department of Agriculture work. In 1933, the airport was provided with a runway, allowing access to both float and wheeled aircraft. By 1937 though, the air field became essentially inactive except for a remaining private interest. In 1993, it received a much-needed upgrade and today air traffic servicing the region is still operational out of Lac du Bonnet.

Road

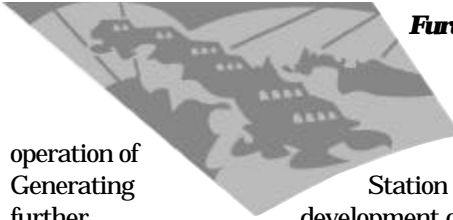
The first roads into the area were seasonal weather-dependent affairs. Many originated as access corridors for forestry, mining and fire suppression. Others, such as PTH 44, were developed as employment projects during the 1930s. With the rise of automobile and transportation-vehicle use, highway development grew. Today, highways 11 and 44 are major conveyances crossing the local region.



Development of the Winnipeg River - “Old Pinawa”

Manitoba's population grew sufficiently by 1900 to justify development of the province's hydro-electric potential. The first dam constructed on the Winnipeg River system was called Pinawa Generating Station (G.S.). Pinawa G.S. began delivering electricity in 1906, initially 7.5 million watts (“megawatts” or MW), which was later increased to 23 MW. It operated until 1951, when it was finally decommissioned.

Today, the ruins of Pinawa G.S. and its adjacent townsite are a Provincial Heritage Site. Now affectionately known as “Old Pinawa” and located about 10 kilometres from present-day Pinawa, it is a popular destination for many summer activities.



Further Development of the Winnipeg River

Following first operation of Pinawa Generating Station in 1906, rapid further development of the Winnipeg River's hydro-electric potential followed. By 1954, six more generating stations had been developed. In order of construction, they are: Pointe du Bois (1911, capacity 72 MW), Great Falls (1923, 132 MW), Slave Falls (1931, 68 MW), Seven Sisters (1931, 150 MW), Pine Falls (1951, 82 MW) and McArthur Falls (1954, 56 MW). Together, these stations can generate a total of 560 MW, about 13% of the electricity produced by the province.



Whiteshell Provincial Park

Look across the river and you will see the north-western reaches of the Whiteshell Provincial Park. This 272,090-hectare natural park was first opened up to the cottagers about 1920. They built their cottages on the lakes closest to the rail lines that served them, such as West Hawk, Brereton and Falcon. After a jurisdictional transfer from the Dominion of Canada to the Province of Manitoba in 1930, the area became a forest reserve in 1931 and finally a provincial park thirty years later in 1961. While the park is alive with individual lakes and rivers, it is most known for straddling one of Canada's most magnificent waterways: the Winnipeg River, which bulges to form numerous lakes along its journey from Lake of the Woods to Lake Winnipeg. Today, the park offers visitors a wide variety of year-round recreational pursuits ranging from canoeing, swimming and hiking in summer and cross-country skiing, ice fishing and snowmobiling in winter, to name just a few.



Wildlife

The eastern boreal landscape is comprised of lakes, rivers and wetlands, evergreen and mixed forests, and rugged granite outcrops. Such diversity of landscape has naturally attracted a whole host of fauna; from omnivores to fishes and birds. Humans have also been attracted to the region for access to these prime hunting, fishing and fur-bearing grounds. Today, the landscape is even more diverse under the impact of small communities, highways, transmission lines and access trails. The region still boasts the ancient lake sturgeon, but no longer supports the black-tailed deer, which has been replaced by its more successful competitor, the white-tailed deer. It is this species that everyone in Pinawa sees sooner or later.



Research and Development - Atomic Energy of Canada Limited

Present-day Pinawa exists because of a decision taken in the late 1950s by Atomic Energy of Canada Limited (AECL) – the Federal Government of Canada Crown Company responsible for the development of the peaceful uses of nuclear energy – to establish a new research laboratory in eastern Manitoba. Known originally as the Whiteshell Nuclear Research Establishment (WNRE), the laboratory was constructed from 1960-1965, simultaneously with the new townsite of Pinawa to house many of its employees. The principal research facility at WNRE was an innovative oil-cooled reactor design known as “WR-1”, which was used to investigate many aspects of nuclear science. Producing up to 55 MW of heat, WR-1 operated for nearly 20 years until it was eventually shut down in 1985. At the height of its research activities, WNRE employed over 1200 people, the major areas of investigation being nuclear-reactor and reactor-materials research, reactor-safety studies, nuclear-waste management and ecological studies. In 1998, due to financial constraints, AECL decided to gradually wind down its research activities at WNRE and to decommission much of its facilities at the site. As new uses for the site and its remaining facilities are being investigated, the legacy of the continuing existence of the beautiful townsite of present-day Pinawa and its lifestyle continues.