# GUIDELINES FOR ORDINARY HIGH WATER LEVEL (OHWL) DETERMINATIONS

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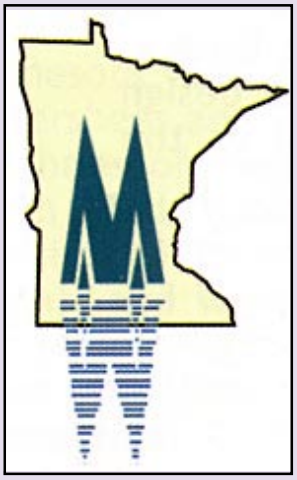

Technical Paper 11

Minnesota
Department of Natural Resources
Waters

June 1993

## Introduction

Minnesota Statutes, Section 103G.005, subdivision 14 defines “ordinary high water level” (OHWL) as the boundary of waterbasins, watercourses, public waters, and wetlands and:

(1) the OHWL is an elevation delineating the HIGHEST water level that has been maintained for a sufficient period of time to leave evidence upon the landscape, commonly the point where the natural vegetation changes from predominantly aquatic to predominantly terrestrial;

(2) for watercourses, the OHWL is the elevation of the top of the bank of the channel; and

(3) for reservoirs and flowages, the OHWL is the operating elevation of the normal summer pool.

The OHWL is the landward extent of DNR jurisdiction over anyone who works in the bed of public waters or public waters wetlands (collectively referred to as public waters) - see Figure 1. It is commonly used in public waters work permits and by local zoning authorities to determine lot size, structure setback, and drainfield location and elevation. It is **NOT:**

- a runout elevation;
- an average water level;
- an extreme high water level;
- nor an arbitrary elevation set by an individual, group or agency.

It has no significance with respect to private ownership.

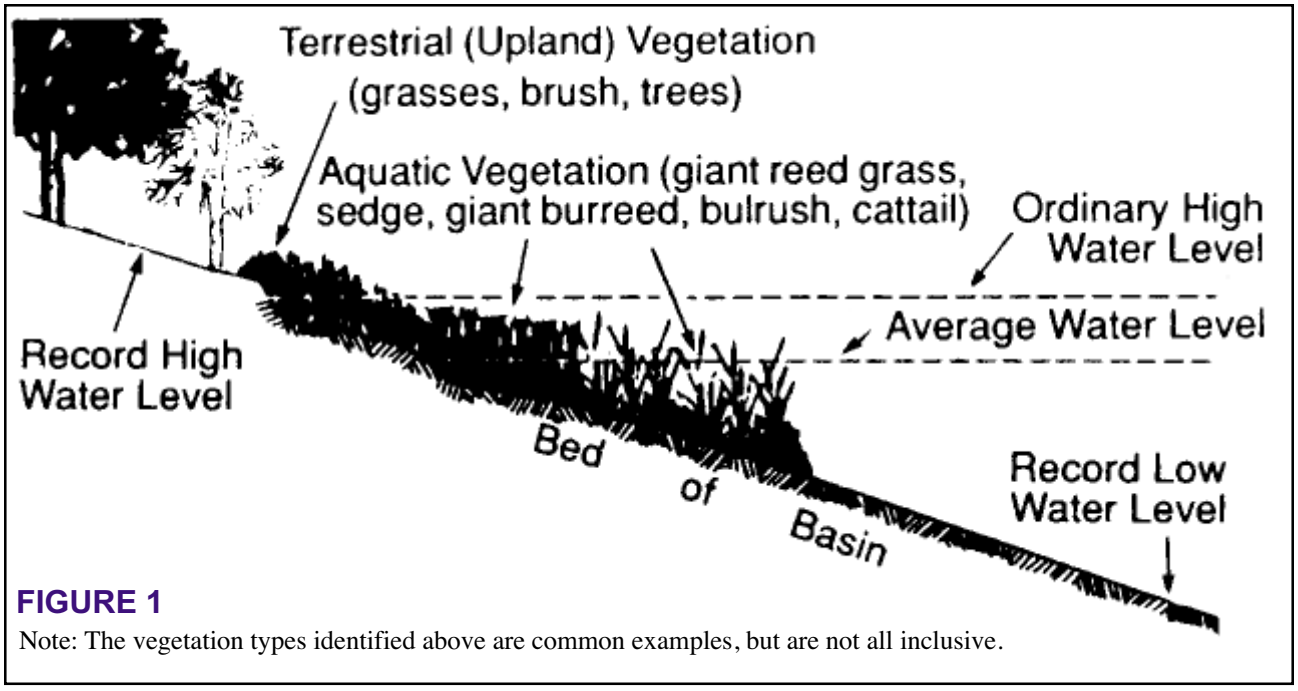


**FIGURE 1**

Note: The vegetation types identified above are common examples, but are not all inclusive.

The methodology used to determine the OHWL of waterbasins and wetlands (basins) was developed in the early 1900's by Adolph F. Meyer, associate professor of hydraulic engineering, University of Minnesota, and consulting engineer. Mr. Meyer was occasionally hired by DNR Waters to make OHWL determinations in cooperation with field surveyors. Emphasis on OHWL determinations increased dramatically in the early 1970's with regionalization of staff and adoption of shoreland zoning ordinances by counties. Over time this methodology has been substantially upheld in many court cases and administrative hearings.

These guidelines apply to public waters and public waters wetlands as defined in Minnesota Statutes, Section 103G.005, subdivisions 15 and 18, which have been inventoried by the Commissioner according to Minnesota Statutes, Section 103G.201 (laws 1979, chapter 199). These guidelines **DO NOT APPLY** to the determination of jurisdictional boundaries with respect to the Wetlands Conservation Act of 1991 (laws 1991, chapter 354), nor the United States Army Corps of Engineers (404 of the Clean Water Act). This document is intended for use by water resource professionals who possess an understanding of surveying.

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## Specific Standards for Ordinary High Water Level Determinations

### (1) Waterbasins and Wetlands

The OHWL is a line of equal elevation surrounding a basin*. The primary evidence of the OHWL are physical features on the landscape that indicate the presence and action of water upon the bed and banks of a basin. A field investigation of the shoreline is required to identify and document the elevation of those physical features that provide the **best available evidence** of the OHWL. (The water level of a basin at the time of the investigation is considered along with other recorded water levels as supporting evidence). The primary physical features searched for are (in order of importance): **A) tree evidence, B) water-formed evidence** and **C) other vegetative evidence.**

**A) TREE EVIDENCE.** Trees are the most permanent type of vegetation on the landscape and their growth patterns around the perimeter of a basin reflect the fluctuation of water levels within the basin. Therefore, whenever appropriate tree evidence is available, the OHWL is based on that evidence**. Appropriate evidence includes trees having characteristics indicating that they were subject to the presence and action of water.

* Except for sloping wetlands; see SLOPING WETLANDS on page 6.
** Except for landlocked basins; see B) WATER-FORMED EVIDENCE on page 5.

Those characteristics include:

- alignment at a relatively uniform elevation with other indicator trees, preferably on flat or gently sloping, undisturbed areas in close proximity to the basin;
- alignment with respect to water-formed evidence (described on page 5);
- washed, exposed roots on the side towards the water; or
- signs of stress or abnormal growth resulting from past water levels (e.g., height, diameter, shape of stem, branch spread, foliage density).

  **Note:** Stress signs are considered carefully as they may be the result of other factors.

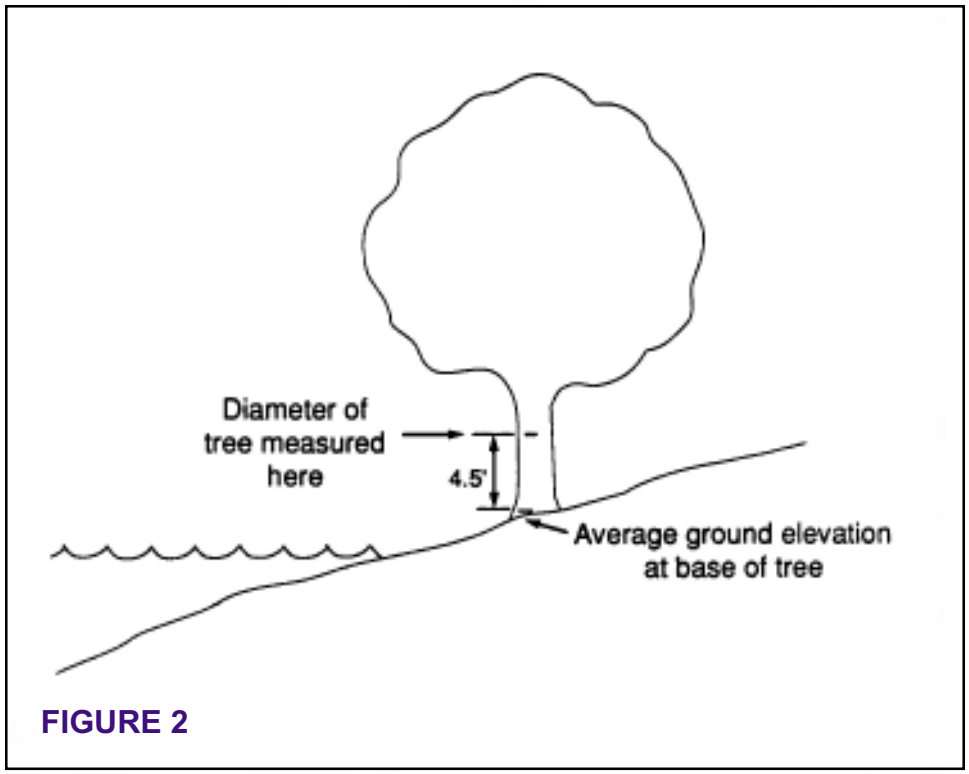



**FIGURE 2**

The OHWL is computed by determining the average reduced elevation of all appropriate indicator trees. The reduced elevation of each tree is determined by subtracting either a full or half diameter breast high (DBH) of the tree from the average ground elevation at the base of the tree (see Figure 2). The tolerance of tree root systems to the presence and action of water determines whether to subtract a full or half diameter (Figure 3).

**FIGURE 3**

# Tree Lists

The following tree species are generally **LESS TOLERANT** to water and are reduced by a full diameter:

| | |
|---|---|
| Sugar maple | Acer saccharum |
| Bitternut hickory | Carya cordiformes |
| Shagbark hickory | Carya ovata |
| Slippery (red) elm | Ulmus fulva or Ulmus rubra |
| Butternut | Juglans cinerea |
| Black walnut | Juglans nigra |
| Red cedar | Juniperus virginiana |
| White spruce | Picea glauca |
| Jack pine | Pinus banksiana |
| Red (Norway) pine | Pinus resinosa |
| White pine | Pinus strobus |
| Black cherry | Prunus serotina |
| White oak | Quercus alba |
| Northern pin oak | Quercus ellipsoidalis |
| Bur oak | Quercus macrocarpa |
| Red oak | Quercus rubra |
| Basswood | Tilia americana |
| *Green ash | Fraxinus pennsylvanica |
| *Black ash | Fraxinus nigra |
| *American (white) elm | Ulmus americana |

*These species are generally more tolerant of periodic flooding, however, it is the experience of DNR Waters that they are more consistent with other tree evidence and pertinent supporting evidence when reduced by a full diameter.

The following tree species are generally **MORE TOLERANT** to water and are reduced by a half diameter:

| | |
|---|---|
| Balsam fir | Abies balsamea |
| Box elder | Acer negundo |
| Red maple | Acer rubrum |
| Silver maple | Acer saccharinum |
| Black spruce | Picea mariana |
| Balsam poplar | Populus balsamifera |
| Cottonwood | Populus deltoides |
| Swamp white oak | Quercus bicolor |
| Black willow | Salix nigra |
| White cedar | Thuja occidentalis |
| Tamarack | Larix laricina |
| *Yellow birch | Betula alleghaniensis |
| *Paper birch | Betula papyrifera |
| *Big tooth aspen | Populus grandidentata |
| *Trembling (Quaking) aspen | Populus tremuloides |

*These species are generally less tolerant of periodic flooding, however, it is the experience of DNR Waters that they are more consistent with other tree evidence and pertinent supporting evidence when reduced by a half diameter.

The tree lists are only for the purpose of determining whether to subtract a half or full DBH.

When available, the following physical features provide **IMPORTANT** supporting evidence of an OHWL based on tree evidence.

- water-formed evidence (described on page 5);
- other vegetative evidence (described on page 5);
- the runout elevation of the basin;
- the outlet geometry and capacity;
- the hydrologic characteristics of the watershed, such as size, storage capacity, and predominant land use.

**B) WATER-FORMED EVIDENCE.** Whenever appropriate tree evidence does not exist at a basin, the best available water-formed evidence is used to determine the OHWL. Water-formed evidence are indicators of past water levels and are the results of the erosion, redistribution or staining of shore materials. Specific types of water-formed evidence are:

- lake banks;
- beach lines or washlines;
- ice ridges or pushes;
- exposed cobble or boulder lines;
- litter and debris lines;
- water stains on natural and artificial landscape features.

For landlocked basins, distinct water-formed evidence that consistently occurs at a higher elevation than tree evidence may be used to determine the OHWL.

When available, the following physical features provide **IMPORTANT** supporting evidence of an OHWL based on water-formed evidence:

- other vegetative evidence (described below);
- the runout elevation of the basin;
- the outlet geometry and capacity;
- the hydrologic characteristics of the watershed such as size, storage capacity and predominant land use.

**C) OTHER VEGETATIVE EVIDENCE.** In the absence of tree or water-formed evidence (specifically at wetlands), other vegetative evidence is used to determine the OHWL. Other vegetative evidence is primarily aquatic vegetation, i.e. plants that only grow in water, or on land that is inundated by water for extended periods in most years.This vegetation most often includes cattail, bulrush, giant reed grass, giant burreed and sedge.

Ground elevations are recorded at the defined landward extent of the best available vegetation, at several locations around the wetland, to identify a representative average elevation at the landward edge of the vegetation. This representative average elevation is the OHWL.

Wetlands with the following water regimes will support the types of vegetation used as evidence.

**PERMANENTLY INUNDATED -** water covers the land surface throughout the year in all years.
**INTERMITTENTLY EXPOSED -** surface water is present throughout the year, except in years of extreme drought.
**SEMI-PERMANENTLY INUNDATED -** surface water persists throughout the growing season in most years. When surface water is absent, the water table is usually at or very near the surface.
**SEASONALLY INUNDATED -** surface water is present for extended periods especially early in the growing season, but is absent by the end of the season in most years. When surface water is absent, the water table is often near the surface.

When available, the following physical features provide **IMPORTANT** supporting evidence of an OHWL based on other vegetative evidence:

- the runout elevation of the basin;
- the outlet geometry and capacity;
- the hydrologic characteristics of the watershed such as size, storage capacity and predominant land use.

**SLOPING WETLANDS.** For some wetlands, the water level varies from one end to the other due to physical factors causing flow, such as ditching or dense vegetation, or where ground water discharges into the wetland at varying elevations. The OHWL may vary in elevation from the upstream end to the downstream end as indicated by the best available evidence on the landscape.

**DISTURBED OR DRAINED WETLANDS.** For basins that have been totally disturbed or drained and no physical evidence remains, the OHWL may be determined by using aerial photographs of past conditions. If the vegetation boundaries that are evident on aerial photos can be accurately relocated with a ground survey using fixed objects that still exist, then the average elevation at the survey points is the OHWL.

Additional information that may be assembled and analyzed as supporting evidence for OHWL determinations includes:

- water level records;
- precipitation records;
- hydrologic information such as channel or wetland slope, topography, soils, artificial and natural drainage into and out of the basin, ground water levels, and ground water relationships to basin levels;
- outlet conditions including the characteristics of any natural or artificial controls that influence hydraulic and hydrologic characteristics of the basin;
- maps and survey data of the basin and its surrounding environs;
- aerial photographs or other photographs that show water level conditions around and within the basin;
- documents about historical events relating to water conditions within the basin;
- type and extent of past and present shoreland development;
- testimony of eyewitnesses on historical water conditions;
- other data that may contribute knowledge of water conditions at the basin.

## (2) Watercourses

Since watercourses lie on a slope, the OHWL is not constant from the source to the mouth. The OHWL at a location along a watercourse is determined by averaging the elevations of the top of channel banks, with consideration given to the degree of slope (gradient) of the watercourse and the character of the channel and channel banks.

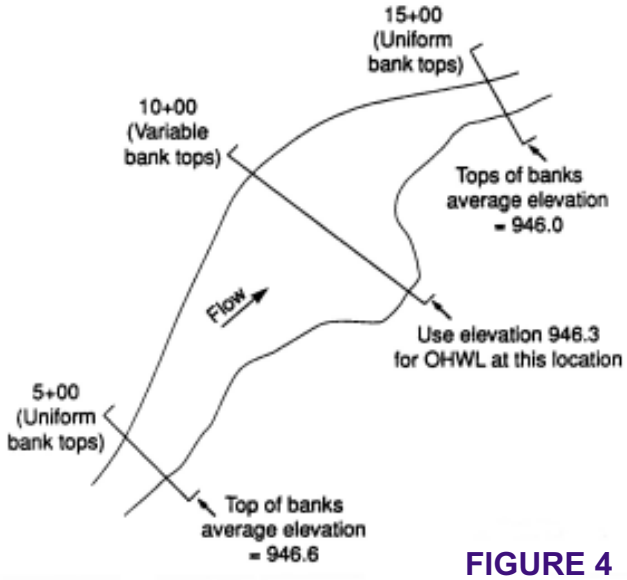



FIGURE 4

When the tops of channel banks on each side of a watercourse vary considerably from one another or are indistinguishable along a given reach of the watercourse, the OHWL for that reach must be consistent with the OHWL established for upstream and downstream locations having more uniform tops of channel banks (see Figure 4).

## (3) Reservoirs and Flowages

The OHWL of reservoirs and flowages is the highest normal summer pool operating elevation described within the operating plan of the reservoir or flowage. The OHWL is a single elevation, provided that the reservoir normal summer pool elevation is specified as a constant for the entire summer. If the normal summer pool is maintained by a range of elevations, the OHWL is the highest elevation of that range.

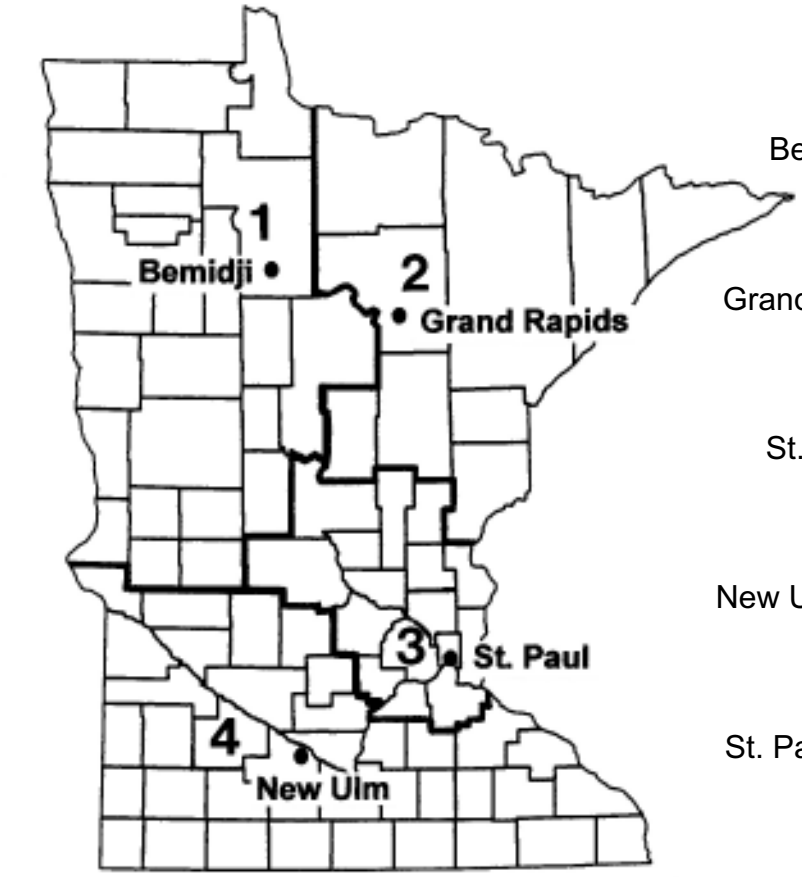
## Special Circumstances

The OHWL of waters regulated by federal, interstate or international agencies is that level agreed upon between the state and the agency as stipulated in an appropriate legal document.

At the confluence of public waters, the OHWL is the highest OHWL of all waters involved.

## Who To Contact

For information about specific OHW elevations or other water-related issues, contact the appropriate DNR Waters office.




**Region 1**
2115 Birchmont Beach Rd N.E.
Bemidji, MN 56601 - (218) 755-3973

**Region 2**
1201 East Highway 2
Grand Rapids, MN 55744 - (218) 327-4416

**Region 3**
1200 Warner Road
St. Paul, MN 55106 - (651) 772-7910

**Region 4**
261 Highway 15 South
New Ulm, MN 56073-8915 - (507) 359-6053

**Central Office**
500 Lafayette Road
St. Paul, MN 55155-4032 - (651) 296-4800

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This information is available in an alternative format upon request

World Wide Web Site Address:
http://www.dnr.state.mn.us/waters

**The DNR Information Center phone numbers:**
Twin Cities: (651) 296-6157
MN Toll Free: 1-888-646-6367
(or 888-MINNDNR)
Telecommunication Device for the Deaf:
(651) 296-5484
MN Toll Free: 1-800-657-3929

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MN/DNR, 500 Lafayette Road, St. Paul, MN 55155-4031;
or the Equal Opportunity Office, Department of the Interior, Washington, D.C. 20240.

## Glossary of Terms

AQUATIC VEGETATION means plants that grow in water or on land that is inundated by water for extended periods in most years.

BEACH LINE or WASHLINE refers to small linear topographic changes in elevation roughly parallel to the waters edge that consist of beach sand, gravel, larger pebbles, cobbles and small boulders heaped up or exposed along the shore by the actions of waves and currents.

BEST AVAILABLE EVIDENCE means evidence that provides the most reliable facts to identify the ordinary high water level based on the statutory definitions for the particular type of protected water involved.

CHANNEL means a natural or artificially created open conduit that periodically or continuously contains moving water, and that may form a connecting link between water bodies.

CHANNEL BANK means the ground immediately bordering the channel that serves to confine the water to the channel during the ordinary course of water flow.

COMMISSIONER means the Commissioner of the Department of Natural Resources.

CONFLUENCE OF WATERS means the intersection of two or more waters. The confluence may be either a specific point or a zone where the waters interact.

DIAMETER BREAST HIGH means the diameter of the tree at a height 4.5 feet above the ground.

ICE RIDGE or PUSH refers to a modification to the topographic characteristics of the shore resulting from a waterbasin's expanding ice sheet and consisting of a linear mound of soil generally parallel to the waters edge.

LAKE BANK means a stretch of rising land bordering a basin distinguished by a change in topographic slope resulting from the presence and action of water or ice eroding and redistributing the soil.

LANDLOCKED BASIN means a water basin or wetland with no surface outlet below its OHWL.

NORMAL SUMMER POOL means the highest water elevation intended to be maintained during the months June through September by operation of control structures of reservoirs and flowages.

RUNOUT ELEVATION means the point at which a water basin begins to outflow.

SLOPING WETLAND means a wetland where the water level varies from one end to the other due to physical factors causing flow through the wetland. The OHWL of a sloping wetland may also vary as indicated by the evidence on the landscape.

WATERBASIN means an enclosed natural depression with definable banks, capable of containing water, that may be partly filled with waters of the state and is discernible on aerial photographs.

WATERCOURSE, NATURAL means a natural channel that has definable beds and banks capable of conducting confined runoff from adjacent land.

WATERCOURSE, ALTERED NATURAL means a former natural watercourse that has been affected by artificial changes to straighten, deepen, narrow or widen the original channel.

WATERCOURSE, ARTIFICIAL means a watercourse artificially constructed by human beings where a natural watercourse was not previously located.

WETLAND, PUBLIC WATERS means all types 3, 4 and 5 wetlands, as defined in the United States Fish and Wildlife Service Circular No. 39 (1971 edition), not included within the definition of public waters, that are ten or more acres in size in unincorporated areas and 2-1/2 or more acres in incorporated areas.