

FLOODPLAIN MANAGEMENT IN WISCONSIN (and what it means for Moose Lake)

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July 6, 2019

National Flood Insurance Program – 1968 NFIA

The National Flood Insurance Program aims to reduce the impact of flooding on private and public structures. It does so by providing affordable insurance to property owners, renters and businesses and by encouraging communities to adopt and enforce floodplain management regulations (www.fema.gov)

Wisconsin Floodplain Zoning Authority Delegated to DNR – 1965 legislation, effective 1968

Where is flood insurance required?

Generally in the “100-year floodplain,” which is the area that is believed to have a 1% statistical probability of being flooded in any given year.

100 Year Flood = “Regional Flood”

Useful Websites:

FEMA Flood Map Service Center <https://msc.fema.gov/portal/home>

WDNR Surface Water Data Viewer <https://dnr.wi.gov/topic/surfacewater/swdv/>
(After opening click “Show Layers” to get the menu)

WDNR Floodplain Management Page <https://dnr.wi.gov/topic/floodplains/>
(rules, model ordinances, background, contact persons)

Who is Involved?

FEMA (Federal Emergency Management Agency) manages the National Flood Insurance Program. Specifically, FEMA:

- Publishes Flood Insurance Rate Maps
- Publishes Flood Insurance Studies
- Issues Letters of Map Change (LOMA, LOMR)
- Conducts technical review of all of the above
- Issues – or declines to issue – flood insurance

Wisconsin DNR (Department of Natural Resources) manages and enforces Wisconsin's floodplain zoning regulations. This includes:

- Assisting communities in adopting floodplain ordinances
- Setting technical standards and providing technical review of studies on which a community's floodplain ordinance will be based
- Approving technical analyses that will be reviewed by FEMA
- If a community has an approved study and does not adopt an ordinance, the DNR has authority to adopt a floodplain ordinance for them.

Wisconsin DNR -Dam Safety Program also plays a role in the Moose Lake story.

Municipalities (cities, villages, and counties) adopt and enforce floodplain zoning ordinances where there is an approved study. If they don't:

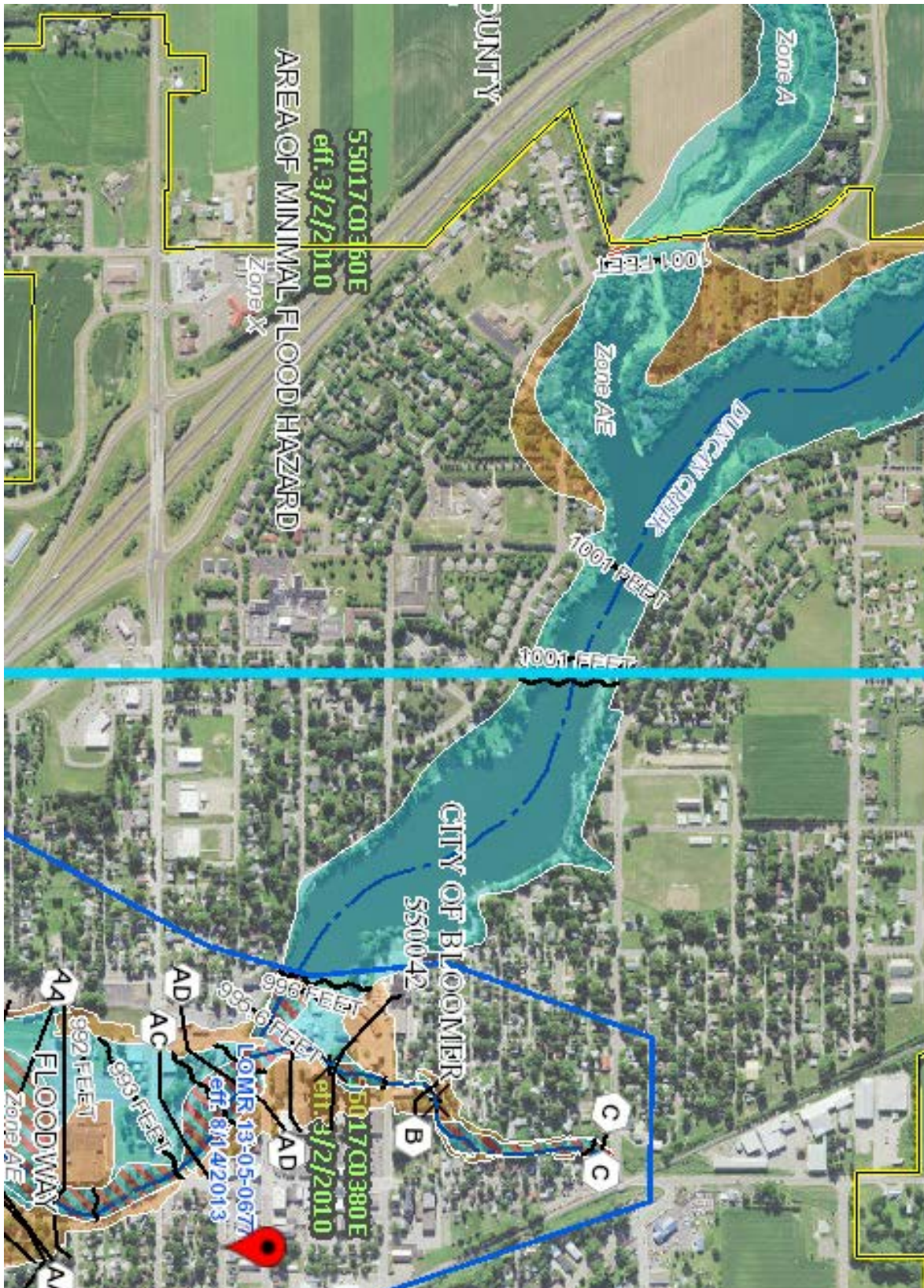
- The state (DNR) can adopt one for them.
- FEMA can deny flood insurance to the entire jurisdiction (not just the noncompliant property)

Insurance companies sell FEMA-underwritten flood insurance policies

Lenders and Realtors confirm a property's floodplain status and inform buyers/sellers that insurance will be required

Consultants and public agencies (e.g. SEWRPC, county planning agencies, DNR, Corps of Engineers, USGS) provide the technical analysis.

Categories of Floodplains (FEMA)



FEMA Floodplain Categories – cont’d

Zone AE - Floodway : Has been analyzed in detail and found necessary to convey moving water during the regional flood. Most restrictive zoning – build nothing.

Zone AE - Flood Fringe (floodplain outside of floodway) Expected to be flooded during the regional flood but conforming (floodproofed) buildings are permissible

Zone X – 500 Year Floodplain, usually no building restrictions

Zone A – Approximate Zone Has not been analyzed in detail but has been mapped as 100-year floodplain based on inspection of maps, air photos, etc. *In Wisconsin all of Zone A is presumed to be floodway.*

Wisconsin Extra – Hydraulic Shadow of Dam

The area downstream of a dam that would be expected to be flooded if the dam failed during the regional flood.

Wisconsin zoning ordinances include the hydraulic shadow. FEMA (flood insurance) maps do not.

Where Does Moose Lake Fit In?

The shoreline properties around Moose Lake are in Zone A – approximate map

Downstream of the dam, the riverfront properties are in Zone AE -mostly floodway, some flood fringe - and also in the hydraulic shadow of the dam.

Analysis Methods (“H & H”)

Hydrology: Figuring out how much water is in the 100 year flood at a given point on a river. Usually a flow rate in cubic feet per second (cfs). For lakes and other areas that store water, this may also involve a total volume of runoff over a period of several days.

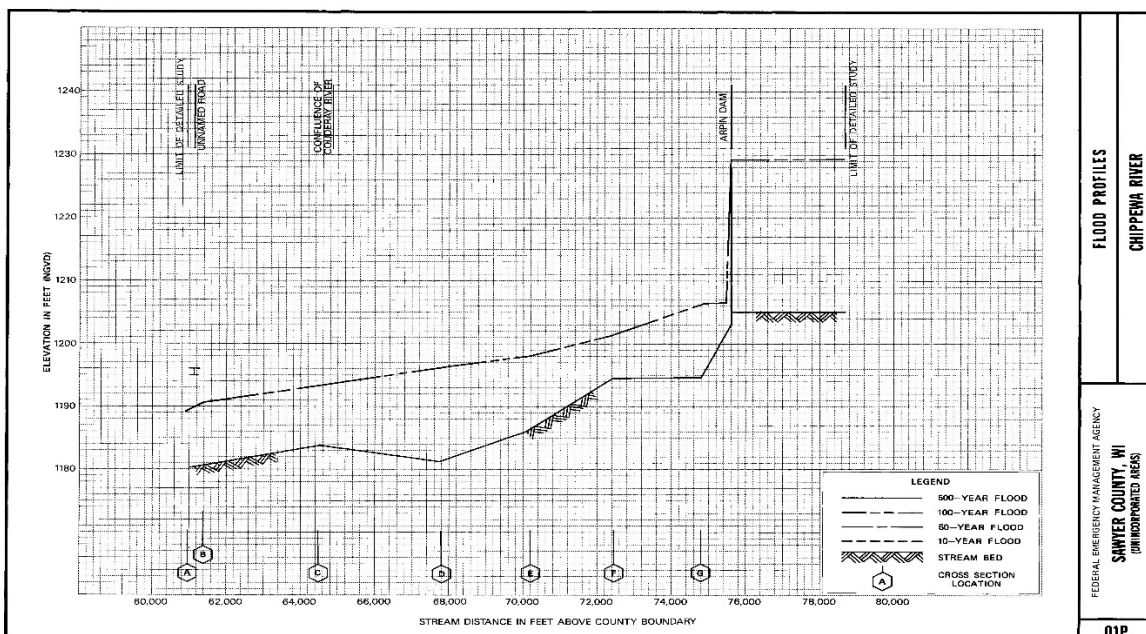
Methods include:

- watershed simulation based on a 100-year rainstorm from a NOAA /NWS publication (most often done with the Corps of Engineers HEC-HMS model)
- Statistical analysis of historic flood flows – only where a stream gage is present; relatively rare.
- Comparison methods – for ungaged streams that can be compared to similar streams that do have gage records and statistical analyses (regression equations developed by US Geological Survey).

These methods usually do not agree and frequently involve “judgment calls.”

Hydraulics: Applying equations for the physics of water movement, using the 100 year flood flow and measured river/floodplain dimensions, to estimate how high the water level will rise at a given location during the 100 year flood.

Usually done with the COE HEC-RAS model ; produces the *regional flood profile:*



Moose Lake – the Back Story

2010-2011: Ayres (1) calculates 100-year, 500-year, and 1,000-year flood for the Moose Lake Dam using precursor to HEC-HMS; and (2) performs dam failure analysis using HEC-RAS. DNR accepts these studies, which together show that a spillway expansion is needed.

2012: Sawyer County approaches Ayres to use the Moose Lake HEC-HMS model to compute the Regional Flood Elevation (RFE) for Moose Lake. DNR's Spooner water management engineer requires that the RFE be computed assuming the spillway cannot be operated and the 100 year flood passes over the top of the dam. Resulting RFE: 1376.95 feet, 6.5 feet higher than the full pool level and 2.5 feet higher than August 1941, the maximum since dam construction in 1922.

2014: Ayres submits design plans on behalf of CFIC to the WDNR for the spillway upgrade. These are accepted along with supporting H&H studies.

2015: NOAA Atlas 14, with updated – and larger – 100 year rainfall depths, becomes fully available for Wisconsin and is now required by WDNR, WisDOT, other agencies for flood related studies.

2015: CFIC completes construction on the dam, submits record drawings to DNR.

2018: MLIA approaches Ayres about unrealistically high RFE; Ayres begins discussion with (new) interim water management engineer for Sawyer County and prepares a proposal.

2019: Ayres reviews proposed re-study approach with WDNR's new water management engineer in Spooner. This prompts WDNR file review and finding that a dam failure analysis for the new spillway still needs to be submitted.

2019: After further discussion with WDNR dam safety and floodplain management staff, Ayres submits DFA using the same design hydrology that was used in 2014 for the spillway; and supplemental analysis for the RFE using NOAA Atlas 14 rainfall. DNR does not accept hydrology using the updated rainfall, saying that "new hydrology" would also require substantial updates to the HEC-HMS model. Ultimately DNR accepts the DFA and (based on communication as of July 2, 2019) determines "best available" RFE for Moose Lake is the one determined in the accepted DFA: 1371.4 feet.

