Experienced paddlers, as well as new users, say that a successful paddling experience in Iowa includes consistent standards for wayfinding and communication. Therefore, signs used on and for state-designated water trails in Iowa are intentionally consistent in color, size, and graphics. The standards included in this manual apply to all state-designated water trails.
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acknowledgments

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Water trails signage includes all signs associated with wayfinding, navigation, and use information viewed from both on-land and on-water. Users should be able to drive to the water trail launches they seek, as well as understand their locations while on-water.

Iowa’s water trails program provides the mechanism and the challenge to create seamless recreational experiences for users across jurisdictions. Locations on state-designated trails, therefore, are identified with river mile numbers, much like the Interstate Highway System. Each launch location references both an access number, representing the river mile where the launch is located, and the launch’s formal name, such as Albright’s Access. River miles are calculated beginning with 0 (zero) at the mouth of a stream and progressing upstream. Consecutive numbering stops at Iowa state boundary limits.
## ON-LAND NAVIGATIONAL SIGNAGE

Wayfinding to launch locations is the first experience users have with Iowa water trails. A straightforward and minimal signage sequence is used to communicate driving directions. Wayfinding signs are consistently used for state-designated trails, regardless of the type of road or road jurisdiction. The Iowa Department of Transportation (DOT) approved these standards to provide identity for the water trails program and to use the fewest signs needed to communicate with drivers looking for launch locations.

All launch entrance-drive locations are consistently signed in both directions using the river mile of the launch as the access number. A minimal sequence of signs is suggested but not required for remaining aspects of launch wayfinding (Figure 6A-1). The series of wayfinding signs is particularly encouraged when multiple turns are required, beginning at the last primary road for both rural and urban routes. Figure 6A-2 illustrates the sequence in a typical rural setting. Wayfinding signage specifications are included in Figure 6A-3.

### Sign Locations

<table>
<thead>
<tr>
<th>Sign Locations</th>
<th>Signage at last primary road turn-off to launch (optional)</th>
<th>Signage at all subsequent turns to reach launch (optional)</th>
<th>Signage at launch turn-in (required)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sign Combinations</strong></td>
<td><img src="access.png" alt="Water Trail Symbol" /></td>
<td><img src="access.png" alt="Access Point Identifier" /></td>
<td><img src="access.png" alt="Access Point Identifier" /></td>
</tr>
<tr>
<td></td>
<td>3. Arrow Sign with Miles</td>
<td></td>
<td></td>
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</table>

*Figure 6A-1. Wayfinding Signage Typical Sequence*
Figure 6A-2.
Wayfinding Signage Location Map (Typical Rural Site)
1. Water Trail Symbol
   Iowa Prison Industry Part #: FDNR41524X24EA
   Size: 24"x24"
   Color: Black on White with Brown Border
   Reflective: Yes
   Material: Aluminum

2. Access Point Identifier
   Iowa Prison Industry Part #: FDNR41924X18EA
   Size: 24"x18"
   Color: White on Brown
   Reflective: Yes
   Material: Aluminum
   Additional Information:
   Specify access number corresponding to river mile

3. Arrow Sign with Miles
   Iowa Prison Industry Part #: FDNR420A24X18EA
   Size: 24"x18"
   Color: White on Brown
   Reflective: Yes
   Material: Aluminum
   Additional Information:
   Specify miles to water access and direction of arrow

4. Arrow Sign
   Iowa Prison Industry Part #: FDNR420B24X12EA
   Size: 24"x12"
   Color: White on Brown
   Reflective: Yes
   Material: Aluminum
   Additional Information: Specify direction of arrow

Launch locations are often included inside existing recreation sites. When appropriate river locations are included within existing recreational land parcels, this is often an efficient use of maintenance equipment, surveillance, and shared facilities such as parking. Figure 6A-4, Signage at Access Points Already Signed, illustrates how the standard water trail launch icon and access number are used in conjunction with existing recreational signage.

Figure 6A-3.
Wayfinding Sign Specifications

Figure 6A-4.
Signage at Access Points Already Signed

Existing County Arrowhead Sign
Attach water trail symbol to post

Existing Park Sign within Cities
Attach water trail symbol to bottom of sign
Additional signage at the launch site visible from on-land includes:

- Launch identification at parking area (required), Figure 6A-5, State-Designated Water Trail Logo and Trail Identification
- Identification and distance to next downstream launch (required), Figure 6A-6, Next Downstream Launch Identification and Distance
- Identification of onsite amenities (optional), Figure 6A-7, Onsite Amenity Signage

**Figure 6A-5.**
State-Designed Water Trail Logo and Trail Identification

**Water Trail Name and Logo**

- **Iowa Prison Industry Part #:** FDNR40012X18EA
- **Size:** 12”x18”
- **Color:** Blue, Green, Orange, and Black on White
- **Reflective:** Yes
- **Material:** Aluminum
- **Additional Information:** Place at head of carry-down trail in launch parking area.

**Figure 6A-6.**
Next Downstream Launch Identification and Distance

**Next Downstream Launch Identification and Distance**

- **Iowa Prison Industry Part #:** FDNR40112X12EA
- **Size:** 12”x12”
- **Color:** White on Blue
- **Reflective:** Yes
- **Material:** Aluminum
- **Additional Information:** Place at head of carry-down trail in launch parking area; can share post with Water Trail Name and Logo sign.
**Figure 6A-7.**

Onsite Amenity Signage

- **Picnic Area**
  - Iowa Prison Industry Part #: FDNR40512X12EA
  - Size: 12"x12"  
  - Color: White on Blue
  - Reflective: Yes
  - Material: Aluminum
  - Additional Information: Place as needed; can share post with Water Trail Name and Logo sign

- **Camping**
  - Iowa Prison Industry Part #: FDNR40312X12EA
  - Size: 12"x12"  
  - Color: White on Blue
  - Reflective: Yes
  - Material: Aluminum
  - Additional Information: Place as needed

- **Rest Room**
  - Iowa Prison Industry Part #: FDNR40712X12EA
  - Size: 12"x12"  
  - Color: White on Blue
  - Reflective: Yes
  - Material: Aluminum
  - Additional Information: Place as needed; can share post with Water Trail Name and Logo sign

- **Hiking Trail**
  - Iowa Prison Industry Part #: FDNR40612X12EA
  - Size: 12"x12"  
  - Color: White on Blue
  - Reflective: Yes
  - Material: Aluminum
  - Additional Information: Place at trail heads and along trail as needed

- **No Camping**
  - Iowa Prison Industry Part #: FDNR40412X12EA
  - Size: 12"x12"  
  - Color: White, Red on Blue
  - Reflective: Yes
  - Material: Aluminum
  - Additional Information: Place as needed
ON-WATER NAVIGATIONAL SIGNAGE

Land ownership rights in Iowa allow agricultural producers to graze livestock with free access to water on streams classified as non-meandered. While many producers have excluded livestock from streams and provided off-stream watering devices, water trail users can still encounter both grazing animals and also barbed-wire fencing running across the stream to contain them. Figure 6A-8, Passable High Fence in Deep Water, illustrates a functional approach for this type of fencing. Disruption of fencing and the safety of water trail users passing under it are both valid concerns. Positive relationships between the water trail sponsor and landowners and renters on the water trail route are critical to ensuring that fencing remains functional for livestock and safe for paddlers.
Paddlers unsure of a water trail route and those paddling longer distances indicated they would benefit from location information visible from on-water. Additional signage visible from on-water includes:

- Identification of the next upcoming launch (Figure 6A-9)
- Bridge identification (Figure 6A-10)
- Portage trail wayfinding (Figure 6A-11)
- Boat navigation arrow (Figure 6A-12)
- Water Trail Rules (Figure 6A-13)

**On-Water Launch Sign**
- **Iowa Prison Industry Part #:** FDNR40224X18EA
- **Size:** 24”x18”
- **Color:** White on Blue
- **Reflective:** Yes
- **Material:** Aluminum

**Bridge Signage for Navigation**
- **Iowa Prison Industry Part #:** FDNR416BRIDGEEA
- **Size:** 18” height, width varies per text
- **Color:** Black on White
- **Reflective:** Yes
- **Material:** Aluminum
- **Additional Information:** Sign size may be adjusted for amount of text; stencils may be used in lieu of this sign

**Portage Arrows**
- **Size:** 8”x8”
- **Color:** White on Blue
- **Reflective:** Yes
- **Material:** Aluminum
- **Additional Information:** Use as an on-water identifier for trailhead to the portage; also use for trail blazes on the portage trail
Water Trail Rules

Respect Private Property.
Much land along this waterway is private. Do not tamper with fences, livestock, or any other property. Enter private land only with permission of the landowner.

Be Safe.
River users are required to have a Personal Floatation Device in the boat. Actually wearing it greatly increases your chance of survival if you capsize. River levels change and conditions can change constantly. Avoid hazards such as snags, and ALWAYS portage at low-head dams.

Limit Alcohol Consumption.
Intoxication on waterways leads to poor judgement and increased risk of drowning.

No Littering or Dumping.
Leave no trace. Volunteers work to keep this river clean.

Boat Navigation Arrow

Iowa Prison Industry Part #: FDNR41712X12EA
Size: 12”x12”
Color: White on Blue
Reflective: Yes
Material: Aluminum
Additional Information:
Place in water or along bank when marking a specific route through a body of water (i.e., navigating a lake or wetland to reduce confusion). Holes punched on all four sides for installation with any orientation.

Figure 6A-12. Boat Navigation Arrow

Water Trail Rules

Iowa Prison Industry Part #: FDNR41312X12EA
Size: 12”x12”
Color: White on Blue
Reflective: Yes
Material: Aluminum
Additional Information:
Place at launches, especially where landowner relations are sensitive, or where there have been other problems.

Figure 6A-13. Water Trail Rules
6B
LOW-HEAD DAM
SIGNAGE
**LOW-HEAD DAM WARNING SIGN**

**SIZING & PLACEMENT**

**DOWNSTREAM DROWNING ZONE**
Signs should be placed at or below the boil line, at a 45° angle downstream¹.

**DROWNING ZONE**
Area of river in which only prompt, qualified rescue is likely to save a victim.

**UPSTREAM DROWNING ZONE**
Signs should be placed at or above the hydraulic line, at a 45° angle upstream².

---

1. Typically within 50’ downstream of dam
2. Distance upstream is typically 3 times the vertical head, often within 20’ of the dam.

---

**GENERAL LOCATIONS OF HAZARD SIGNS**

The specific types and sizes of warning signs needed for each hazard on a state-designated water trail are determined individually using a consistent set of criteria. Once the sign design and size is determined, each sign is located adjacent to the hazard based on hydraulic criteria and other local conditions. Low-head dams, for example, include unsafe currents upstream, downstream, and at the site of the dam for boaters and those wading (Figure 6B-1). These high-current areas are known as “drowning zones.” Signs identifying drowning zone limits surrounding a hazard must allow a boater to reach shore before being carried by currents over the dam.

All signs viewed from the water are typically sited on the bank at a 45-degree angle facing upstream. The exception to this is the Drowning Zone sign placed below a dam facing downstream and offset at a 45-degree angle. Any sign placed on the banks should be as far above the bankfull water elevation as possible. Depending on local conditions, alternative mounting systems such as buoys, overhanging cables, or bridges may be used, in which case the signs may face directly upstream or downstream.

Signs included in this manual can be ordered from vendors, including Iowa Prison Industries (IPI). Note that size, color, and design of all signs corresponds to standards in this manual. Optional features include vandal proof coating using 3M™Premium Protective Overlay Film Series 1160.
HAZARD SIGN SCENARIOS

River users are minimally provided with two upstream warnings to prepare to leave the stream before reaching a drowning zone and dam. Because rivers often damage signs during flood times and because sign vandalism can be a regular occurrence, some redundancy is programmed into this system to allow time for maintenance responses. River users are directed to a specific side of a stream to reach portage routes or launch locations to avoid the drowning zone. The sequence of signs included for each dam is summarized in Figure 6B-2. Note that differences in sign wording exist based on the course of action available to paddlers as they near hazards. Options include portage trails around the hazards or launches before the drowning zones (which may or may not be the end of the water trail).

**SCENARIOS POSSIBLE FOR RIVER USERS TO AVOID A DROWNING ZONE AND DAM**

1. **EARLY WARNING SIGN**
   - To alert river users to the upcoming dam and cue them to watch for instructions about exiting safely. Required only if landing or egress is located 300 feet or less upstream of a dam, although it may be used optionally to be conservative.
   - IPI Part Number: FDNR408EA

2. **LAST LANDING ABOVE SIGN**
   - To alert river users of the last landing above the dam.
   - IPI Part Number: FDNR410EA

3. **LAND-BASED LAST LANDING ABOVE SIGN**
   - To alert those staging watercraft or putting in at the launch.
   - IPI Part Number: FDNR411EA

4. **MOVE LEFT OR RIGHT SIGN**
   - To cue river users to move over for last safe exit and/or portage (20/20 vision).
   - IPI Part Number: FDNR414EA

5. **LAST SAFE EXIT SIGN**
   - To mark the last safe exit and/or portage (20/20 vision).
   - IPI Part Number: FDNR421EA

6. **DROWNING ZONE, UP/DOWNSTREAM LIMITS SIGN**
   - To mark the area beyond which no one should enter because of dangerous currents. Exact placement based on field conditions (20/40 Vision).
   - IPI Part Number: FDNR422EA

7. **PEDESTRIAN DROWNING ZONE WARNING SIGN**
   - Placed at pedestrian approaches to drowning zone areas. Exact placement based on field conditions.
   - IPI Part Number: FDNR40918X24EA

8. **OTHER HAZARDS SIGN**
   - Placed on-land or on-water to alert river users to an upcoming non-dam hazards.
   - IPI Part Number:
SIGN LETTER HEIGHT CALCULATIONS

Criteria used to size all aspects of signs viewed from the water are related to river width at the sign location and includes text height, sign panel size, and text spacing. Text is based on a modified version of the Army Corps of Engineers sign manual standards. The minimum text height for the main message for all water-viewed signs is 4 inches, regardless of river width. The font for all text is Arial.

Begin calculations for text height by determining river width where each sign is to be located. Width can be measured on the Iowa DNR Interactive Mapping Site using aerial photographs (www.iowadnr.gov/mapping/index.html).

The formula for calculating text height is illustrated on the right. Figure 6B-3 and Table 6B-1 are provided to calculate the 20/40 vision viewing distance (V). This value is used to calculate the height of the capital letter text (A) that would be legible from the viewing distance. The sign panel size is then determined based on proportions of the capital letter height and text-spacing requirements.

\[
V (\text{ft}) = \frac{(M_1 - M_2)}{\cos 45^\circ}
\]

\[
M_1 - M_2 = 0.5 \text{ river width (ft)} \text{ (for 45° only)}
\]

\[
V (\text{ft}) = \frac{(0.5 \text{ river width (ft)})}{0.707}
\]

\[
A (\text{in}) = \frac{V}{20} \times 0.50 = \frac{20/20 A (\text{in})}{0.50} = 20/20 A (\text{in})
\]

\[
A (\text{in}) = \frac{V}{20} \times 0.75 = \frac{20/30 A (\text{in})}{0.75} = 20/30 A (\text{in})
\]

(Always round up to nearest inch.)

**20/40-VISION CHART FOR DROWNING ZONE SIGNS**

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Table 6B-1. Capital Letter Height for 20/40 Vision (Required for all drowning zone signs)

**Figure 6B-3.**
Calculating Viewing Distance Based on River Width
Drowning Zone signs use 20/40 vision standards. In most other locations, 20/20 vision signs are sufficient, as field testing shows they are visible across the river’s width. However, larger 20/30 vision signs are recommended in settings where high-speed motorized boat traffic is common, or where local land managers determine a high hazard.

Table 6B-2. Capital Letter Height for 20/30 Vision (Optional when greater visibility is desired)

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Table 6B-3. Capital Letter Height for 20/20 Vision (Appropriate for most settings, with the exception of drowning zone signs)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>0-315</td>
<td>4</td>
<td>1583-1661</td>
<td>21</td>
<td>2881-2958</td>
<td>38</td>
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<tr>
<td>316-395</td>
<td>5</td>
<td>1662-1741</td>
<td>22</td>
<td>2959-3036</td>
<td>39</td>
</tr>
<tr>
<td>396-475</td>
<td>6</td>
<td>1742-1820</td>
<td>23</td>
<td>3037-3114</td>
<td>40</td>
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<tr>
<td>476-553</td>
<td>7</td>
<td>1821-1899</td>
<td>24</td>
<td>3115-3192</td>
<td>41</td>
</tr>
<tr>
<td>554-632</td>
<td>8</td>
<td>1900-1978</td>
<td>25</td>
<td>3193-3271</td>
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<tr>
<td>633-711</td>
<td>9</td>
<td>1979-2057</td>
<td>26</td>
<td>3272-3349</td>
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<td>712-790</td>
<td>10</td>
<td>2058-2137</td>
<td>27</td>
<td>3350-3427</td>
<td>44</td>
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<tr>
<td>791-870</td>
<td>11</td>
<td>2138-2176</td>
<td>28</td>
<td>3428-3505</td>
<td>45</td>
</tr>
<tr>
<td>871-949</td>
<td>12</td>
<td>2177-2254</td>
<td>29</td>
<td>3506-3583</td>
<td>46</td>
</tr>
<tr>
<td>950-1028</td>
<td>13</td>
<td>2255-2332</td>
<td>30</td>
<td>3584-3662</td>
<td>47</td>
</tr>
<tr>
<td>1029-1107</td>
<td>14</td>
<td>2333-2410</td>
<td>31</td>
<td>3663-3740</td>
<td>48</td>
</tr>
<tr>
<td>1108-1186</td>
<td>15</td>
<td>2411-2489</td>
<td>32</td>
<td>3741-3818</td>
<td>49</td>
</tr>
<tr>
<td>1187-1186</td>
<td>16</td>
<td>2490-2567</td>
<td>33</td>
<td>3819-3896</td>
<td>50</td>
</tr>
<tr>
<td>1267-1345</td>
<td>17</td>
<td>2568-2645</td>
<td>34</td>
<td>3897-3974</td>
<td>51</td>
</tr>
<tr>
<td>1346-1424</td>
<td>18</td>
<td>2646-2723</td>
<td>35</td>
<td>3975-4053</td>
<td>52</td>
</tr>
<tr>
<td>1425-1503</td>
<td>19</td>
<td>2724-2801</td>
<td>36</td>
<td>4054-4131</td>
<td>53</td>
</tr>
<tr>
<td>1504-1582</td>
<td>20</td>
<td>2802-2880</td>
<td>337</td>
<td>4132-4209</td>
<td>54</td>
</tr>
</tbody>
</table>
EARLY WARNING (ON-WATER) SIGN

**Purpose:**
To alert river users about an upcoming dam.

**Band Color:** Orange
**Reflective:** Yes
**Material:** Aluminum

This sign is optional. If the last launch is less than 300 feet upstream from the dam, then this sign, along with the Last Landing Above (On-Water) sign, is required. It may also be used as an extra precaution where high-speed boat traffic is common, or areas where local land managers determine a high hazard.

Figure 6B-4 describes required dimensions and spacing. “Warning” is in Arial bold font.

Placement is guided by local site conditions. There is no minimum length upstream of dam. The sign may be placed anywhere along the river. More than one sign may be needed, depending on site conditions.

Example: Text height (A) = 4", Sign panel = 40"x25"

- a. 0.5A (2")
- b. 0.25A (1")
- c. Minimum 1.5A (6")
- d. Minimum 0.5A (2")
  (A or 1.5A is preferred)*
- e. 0.25A (1") Measured from the bottom of the 'g' on Warning
- f. 0.25A (1")
- g. A (Text height) See Table 6B-3
- h. 0.5A (2")
- i. 0.5A (2")

* Dimension applies to most-left text on the sign
LAST LANDING ABOVE (ON-WATER) SIGN

Purpose:
To alert river users of the upcoming dam and to cue them to watch for instructions about exiting safely.

Band Color: Orange
Reflective: Yes
Material: Aluminum

This sign is required unless the last launch is more than 300 feet upstream from the dam and the Last Launch Above (On-Land) sign is implemented. In this case the sign is optional and could be used as an extra precaution.

Figure 6B-8 describes required dimensions and spacing. "Warning" is in Arial bold font. Three message variations are possible for this sign, depending on the site. Figures 6B-5, 6B-6, and 6B-7 show these alternatives.

Example: Text height (A) = 4", Sign panel = 40"x40"

| a. 0.5A (2") |
| b. 0.25A (1") |
| c. Minimum 1.5A (6") |
| d. 0.25A (1") Measured from the bottom of the 'g' on Warning |
| e. 0.25A (1") |
| f. 0.5A (2") |
| g. A (Text height) See Table 6B-3 |
| h. 0.125A (.5") |
| i. A (4") |
| j. Minimum 0.5A (2") (A or 1.5A is preferred)* |
| k. 0.5A (2") |

* Dimension applies to most-left text on the sign

Figure 6B-5
Sign Face to Identify End of Designated Water Trail Ahead

Figure 6B-6
Sign Face for Site Without Portage Trail/With Last Landing Ahead

Figure 6B-7
Sign Face for Site with Portage Trail Ahead

Figure 6B-8
"Last Landing Above (On-Water) Sign" Face Dimensions
LAST LANDING ABOVE (ON-LAND) SIGN

**Purpose:**
To alert river users putting in at the launch about the upcoming dam and to cue them to watch for instructions about exiting safely.

**Band Color:** Orange
**Reflective:** Yes
**Material:** Aluminum

This sign is required and meant to be viewed from land at a launch. The capital text height is 2 inches, regardless of river width.

Figure 6B-11 describes required dimensions and spacing. Two message variations are possible for this sign, depending on the site. Figure 6B-9 and Figure 6B-10 show these options. “Warning” is in Arial bold font.

Proper radii to prevent injury on sign corners is determined by sign manufacturer.

**Example:** Text height (A) = 2", Sign panel = 18"x24"

- a. A (2")
- b. 0.5A (1")
- c. Minimum 1.5A (3")
- d. Minimum A (2")
  (1.5A is preferred)*
- e. 0.5A (1") Measured from the bottom of the 'g' on Warning
- f. 0.5A (1")
- g. 0.5A (1")
- h. 2"
- i. 0.125A (.25")
- j. 2"
- k. 0.5A (1")
- l. 1.5A (3")

* Dimension applies to most-left text on the sign
**MOVE LEFT/RIGHT (ON-WATER) SIGN**

**Purpose:**
To alert users of the upcoming dam and cue them to move to either the left or right side of the river to exit safely.

**Band Color:** Orange  
**Reflective:** Yes  
**Material:** Aluminum

This sign is required, unless exit is possible on both sides of the river. The sign should be placed a minimum of 3 times the river width upstream from the Last Safe Exit sign so river users have enough reaction time to move over for the portage and/or last safe exit.

Figure 6B-14 describes required dimensions and spacing. Two message variations are possible for this sign, depending on the site. Figure 6B-12 and Figure 6B-13 show these options. “Warning” is in Arial bold font.

<table>
<thead>
<tr>
<th>Example: Text height (A) = 4&quot;, Sign panel = 41&quot;x33&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. 0.5A (2&quot;)</td>
</tr>
<tr>
<td>b. 0.25A (1&quot;)</td>
</tr>
<tr>
<td>c. Minimum 1.5A (6&quot;)</td>
</tr>
<tr>
<td>d. Minimum 0.5A (2&quot;)</td>
</tr>
<tr>
<td>(A or 1.5A is preferred)*</td>
</tr>
<tr>
<td>e. 0.25A (1&quot;) Measured from the bottom of the ‘g’ on Warning</td>
</tr>
<tr>
<td>f. 0.25A (1&quot;)</td>
</tr>
<tr>
<td>g. A (Text height) See Table 6B-3</td>
</tr>
<tr>
<td>h. 0.125A (0.5&quot;)</td>
</tr>
<tr>
<td>i. A (4&quot;)</td>
</tr>
<tr>
<td>j. 0.5A (2&quot;)</td>
</tr>
<tr>
<td>k. 0.5A (2&quot;)</td>
</tr>
</tbody>
</table>

* Dimension applies to most-left text on the sign

---

**Figure 6B-12**  
Sign Face to Identify Bank for Last Safe Exit

**Figure 6B-13**  
Sign Face to Identify Bank for Portage Trail

**Figure 6B-14**  
"Move Left/Right (On-Water) Sign" Face Dimensions
LAST SAFE EXIT (ON-WATER) SIGN

Purpose:
To mark the last safe exit and/or portage route before the dam.

Band Color: Red
Reflective: Yes
Material: Aluminum

This sign is required. The “Last Safe Portage Here” message should only be used on the side of the river that the portage is on.

Figure 6B-17 describes required dimensions and spacing. Two message variations are possible for this sign, depending on the site. Figure 6B-15 and Figure 6B-16 show these options. “Danger” is in Arial bold font.

Example: Text height (A) = 4", Sign panel = 40"x40"

a. 0.5A (2")
b. 0.25A (1")
c. Minimum 1.5A (6")
d. 0.25A (1") Measured from the bottom of the ‘g’ on Danger
e. 0.25A (1")
f. A (4")
g. 0.125A (0.5")
h. A (Text height) See Table 6B-3
i. 0.5A (2")
j. A (4")
k. 0.125A (0.5")
I. Minimum 0.5A (A or 1.5A is preferred)*
m. 0.5A (2")
n. 1.4A (5.6")
o. 1.4A (5.6")

* Dimension applies to most-left text on the sign

Figure 6B-17
“Last Safe Exit (On-Water) Sign” Face Dimensions

Figure 6B-15
Sign Face to Identify Last Safe Exit

Figure 6B-16
Sign Face to Identify Last Safe Portage
DROWNING ZONE, UP/DOWNSTREAM LIMITS (ON-WATER) SIGN

**Purpose:**
To mark the upstream and downstream limits beyond which no one should enter because of dangerous currents.

**Band Color:** Red  
**Reflective:** Yes  
**Material:** Aluminum

This sign is required. The diamond shape, as well as the “X” in the center, is a universal symbol of a dangerous hazard.

Figure 6B-18 describes required dimensions and spacing. Sign panel size is determined based on required text height. (See below.) Text is Arial bold font with a black outline.

---

**Example:** Text height (A) = 4", Sign panel = 17”x17”

- a. 45° Rotation  
- b. 0.5A (2")  
- c. A (Text height) See Table 6B-1  
- d. 0.125A (.5")  
- e. 0.25A (1")  
- f. 0.125A (.5")  
- g. 0.0625A (.25")

---

**Sign Size Based on Text Height**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>17&quot;x17&quot;</td>
<td>13</td>
<td>54&quot;x54&quot;</td>
</tr>
<tr>
<td>5</td>
<td>21&quot;x21&quot;</td>
<td>14</td>
<td>58&quot;x58&quot;</td>
</tr>
<tr>
<td>6</td>
<td>25&quot;x25&quot;</td>
<td>15</td>
<td>62&quot;x62&quot;</td>
</tr>
<tr>
<td>7</td>
<td>29&quot;x29&quot;</td>
<td>16</td>
<td>66&quot;x66&quot;</td>
</tr>
<tr>
<td>8</td>
<td>33&quot;x33&quot;</td>
<td>17</td>
<td>70&quot;x70&quot;</td>
</tr>
<tr>
<td>9</td>
<td>37&quot;x37&quot;</td>
<td>18</td>
<td>74&quot;x74&quot;</td>
</tr>
<tr>
<td>10</td>
<td>41.5&quot;x41.5&quot;</td>
<td>19</td>
<td>78&quot;x78&quot;</td>
</tr>
<tr>
<td>11</td>
<td>46&quot;x46&quot;</td>
<td>20</td>
<td>82&quot;x82&quot;</td>
</tr>
<tr>
<td>12</td>
<td>50&quot;x50&quot;</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Figure 6B-18.**  
*Drowning Zone, Up/Downstream Limits (On-Water) Sign* Face Dimensions
PEDESTRIAN DROWNING ZONE WARNING (ON-LAND) SIGN

**Purpose:**
To alert people attempting to wade or otherwise access the river about the dangers of the recirculating currents within the drowning zone.

**Band Color:** Red  
**Reflective:** Yes  
**Material:** Aluminum

These signs are required at all pedestrian approaches above and below the dam and are meant to be viewed from land.

Figure 6B-19 describes required dimensions and spacing. The capital text height is 1.5 inches, regardless of river width. “Danger!” is in Arial bold font with a black outline.
OTHER HAZARDS (ON-WATER OR ON-LAND) SIGN

Purpose:
To alert users to an upcoming non-dam hazard.

Band Color: Orange
Reflective: Yes
Material: Aluminum

This warning sign is optional and can be viewed from land or on water at the last access upstream of the hazard. Refer to Table 6B-3 for the capital text height for on-water signs. For on-land signs the capital text height is 2 inches, regardless of river width. The hazard itself is likely left unmarked except in certain circumstances such as bridge reconstruction.

For land based signs, a proper radii to prevent injury on sign corners is determined by sign manufacturer.

Figure 6B-21 describes required dimensions and spacing. Text describing the hazard may be substituted with “Log-Jam,” “Obstruction” or other hazards as they may apply. Figure 6B-20 shows a few options. “Warning” is in Arial bold font.

Example: Text height (A) = 4”, Sign panel = 40"x19"

- a. 0.5A (2")
- b. 0.25A (1")
- c. Minimum 1.5A (6")
- d. Minimum 0.5A (2") (A or 1.5A is preferred)*
- e. 0.25A (1") Measured from the bottom of the ‘g’ on Warning
- f. 0.25A (1")
- g. A (Text height) See Table 6B-3
- h. 0.5A (2")

* Dimension applies to most-left text on the sign

Figure 6B-20
Sign Face Examples for Other Hazards

Figure 6B-21
“Other Hazards” Face Dimensions
A number of factors led to customization of signs in the vicinity of the Des Moines Water Works Park boat ramp.

- The rock dam immediately downstream of the boat ramp would not typically be signed; however, Water Works staff wanted to sign it as a low-head dam for liability reasons and to reduce confusion between the rock dam and the low-head dam ahead.
- Sign No. 2 is closely associated with the boat ramp at the top of the bank on its downstream edge; this was the clearest location to direct river users to the landing.
DES MOINES CASE STUDY: Water Works Park Dam On The Raccoon River

NOTES EXPLAINING HOW STANDARD SIGNAGE SEQUENCE WAS MODIFIED AT THIS LOCATION

Sign No. 2 includes two messages that would typically be on separate signs. Des Moines Water Works staff wanted a second early warning, and there was a need to advise paddlers to move right for the portage at the same location, so the signs were combined for clarity.
DES MOINES CASE STUDY:
Scott Avenue Dam On The Des Moines River

The Scott Avenue Dam in Des Moines is located at the intersection of the Raccoon River and the Des Moines River.

Table 6B-6. Signs Used Near Scott Avenue Dam

<table>
<thead>
<tr>
<th>Sign Type and Location</th>
<th>Example</th>
<th>Sign Size</th>
<th>Text Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>EARLY WARNING SIGN</td>
<td></td>
<td>72&quot;×44&quot;</td>
<td>7&quot;</td>
</tr>
<tr>
<td>MOVE LEFT SIGN</td>
<td></td>
<td>72&quot;×68&quot;</td>
<td>7&quot;</td>
</tr>
<tr>
<td>LAST SAFE EXIT SIGN</td>
<td></td>
<td>82&quot;×61&quot;</td>
<td>7&quot;</td>
</tr>
<tr>
<td>DROWNING ZONE UP/DOWNSTREAM LIMITS SIGN</td>
<td></td>
<td>37&quot;×37&quot;</td>
<td></td>
</tr>
<tr>
<td>DROWNING ZONE UP/DOWNSTREAM LIMITS SIGN</td>
<td></td>
<td>46&quot;×46&quot;</td>
<td></td>
</tr>
<tr>
<td>DROWNING ZONE UP/DOWNSTREAM LIMITS SIGN</td>
<td></td>
<td>75&quot;×75&quot;</td>
<td></td>
</tr>
<tr>
<td>DROWNING ZONE UP/DOWNSTREAM LIMITS SIGN</td>
<td></td>
<td>66&quot;×66&quot;</td>
<td></td>
</tr>
<tr>
<td>PEDESTRIAN DROWNING ZONE WARNING SIGN</td>
<td></td>
<td>18&quot;×24&quot;</td>
<td></td>
</tr>
</tbody>
</table>

NOTES EXPLAINING HOW STANDARD SIGNAGE SEQUENCE WAS MODIFIED AT THIS LOCATION

A number of factors led to customization of signs at this location.

- The last boat landing on the Raccoon River is within 300 feet of the dam, and the dam is in an urban area flanked by high-use recreational trails. In this case, the **Last Landing Above (On-Water)** sign was implemented, along with two **Early Warning** signs.
- Sign No. 2 contained two messages that would typically be on separate signs. City of Des Moines staff wanted a second early warning, and there was a need to advise paddlers to move right for the portage at the same location, so the signs were combined for clarity.
**Table 6B-7.**

Signs Used Near Birdland Park Boat Launch

<table>
<thead>
<tr>
<th>Sign Type and Location</th>
<th>Example</th>
<th>Sign Size</th>
<th>Text Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>LAST LANDING ABOVE (ON-WATER) SIGN</td>
<td>Dam Ahead 1.4 Miles Last Landing Water Trail Ends Here</td>
<td>92”×108”</td>
<td>9”</td>
</tr>
<tr>
<td>LAST LANDING ABOVE (ON-LAND) SIGN</td>
<td>Dam Ahead 1.4 Miles Last Boat Landing</td>
<td>18”×24”</td>
<td>2”</td>
</tr>
</tbody>
</table>

**NOTES EXPLAINING HOW STANDARD SIGNAGE SEQUENCE WAS MODIFIED AT THIS LOCATION**

The Birdland Marina is in an urban setting with high-speed boat traffic, so the 20/30 vision chart was used to develop appropriate letter heights for sign No.1.
### DES MOINES CASE STUDY:
Des Moines River / Center Street Dam

NOTES EXPLAINING HOW STANDARD SIGNAGE SEQUENCE WAS MODIFIED AT THIS LOCATION

An optional early warning sign (No. 1) was added on the University Avenue Bridge. Well downstream of the end of the water trail, additional emergency egress is delineated in an area where it would be possible for boaters to get out of the river channel if they were in distress.

**Table 6B-8.**
Signs Used Near Center Street Dam

<table>
<thead>
<tr>
<th>Hazard Signs Near Center Street Dam</th>
<th>Sign Type and Location</th>
<th>Example</th>
<th>Sign Size</th>
<th>Text Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 EARLY WARNING SIGN</td>
<td>Placed on University bridge</td>
<td><strong>Warning</strong></td>
<td>66&quot;×44&quot;</td>
<td>7&quot;</td>
</tr>
<tr>
<td>2 LAST SAFE EXIT</td>
<td>Placed on East and West banks at 45° or on I-235 bridge</td>
<td><strong>Danger</strong></td>
<td>84&quot;×60&quot;</td>
<td>7&quot;</td>
</tr>
<tr>
<td>3 DROWNING ZONE</td>
<td>Placed upstream on cables over river. Placed 200' downstream of dam on levee tops at 45°</td>
<td><strong>Danger</strong></td>
<td>46&quot;×46&quot;</td>
<td></td>
</tr>
<tr>
<td>4 PEDESTRIAN DROWNING ZONE WARNING SIGN</td>
<td>Placed at all pedestrian approaches to dam</td>
<td><strong>Danger</strong></td>
<td>18&quot;×24&quot;</td>
<td></td>
</tr>
</tbody>
</table>
The two dams shown here on the Upper Iowa River are classic examples of dams on a small river in a rural setting in which 20/20 vision signs are used. This dam is not visible on-water. As such, three upstream warning signs are required, rather than the two typical series of two signs.

The upper dam has boat ramps located downstream of the dam and within 300 feet upstream of the dam. Sign No. 3 in Table 6B-9 performs the function of two signs: Last Landing Above (On-Water) and Last Safe Exit sign. Combining the messages in this way is encouraged when signs would otherwise be placed at approximately the same location. The red color is used because the sign is near the drowning zone.

The launch located just below the upper dam is also the last launch before the lower dam, 4.7 miles downstream.

**Table 6B-9.**

<table>
<thead>
<tr>
<th>Sign Type and Location</th>
<th>Example</th>
<th>Sign Size</th>
<th>Text Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>EARLY WARNING SIGN</td>
<td>Placed 1,500’ upstream of dam on bank at 45°</td>
<td>Warning</td>
<td>40×25, 4”</td>
</tr>
<tr>
<td>MOVE RIGHT SIGN</td>
<td>Placed 335’ upstream of portage on bank at 45°</td>
<td>Warning</td>
<td>42×33, 4”</td>
</tr>
<tr>
<td>LAST SAFE EXIT SIGN</td>
<td>Placed slightly upstream of portage on bank at 45°</td>
<td>Danger</td>
<td>37×47, 4”</td>
</tr>
<tr>
<td>DROWNING ZONE UP/DOWNSTREAM LIMITS SIGN</td>
<td>Placed upstream and downstream of dam on banks at 45°</td>
<td>Warning</td>
<td>17×17</td>
</tr>
<tr>
<td>LAST LANDING ABOVE (ON-LAND) SIGN</td>
<td>Placed at the top of the upper boat launch facing inland</td>
<td>Warning</td>
<td>18×24, 2”</td>
</tr>
<tr>
<td>DROWNING ZONE UP/DOWNSTREAM LIMITS SIGN</td>
<td>Placed at the top of the lower boat launch facing inland warning users of the Lower Dam</td>
<td>Warning</td>
<td>24×24, 2”</td>
</tr>
<tr>
<td>PEDESTRIAN DROWNING ZONE WARNING SIGN</td>
<td>Placed at all pedestrian approaches to dam</td>
<td></td>
<td>18×24</td>
</tr>
</tbody>
</table>
WINNESHIEK COUNTY CASE STUDY:
Lower Dam On The Upper Iowa River

There is only one Drowning Zone Downstream sign located on the north bank downstream of the dam to mark the lower limits of the drowning zone. The existing site conditions on the south bank area below Lower Dam are both highly erosive and depositional during flood events. The lower limit Drowning Zone sign was not implemented on the south bank at this site because of this difficulty. The remote location of this site also makes it unlikely that power boats will approach the dam from downstream.

Table 6B-10.
Signs Used Near Lower Dam

<table>
<thead>
<tr>
<th>Hazard Signs Near Lower Dam</th>
<th>Sign Type and Location</th>
<th>Example</th>
<th>Sign Size</th>
<th>Text Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early Warning Sign</td>
<td>Placed 2,100’ upstream of dam on bank at 45°</td>
<td>Warning Dam Ahead 2,100 Feet</td>
<td>42”x26”</td>
<td>4”</td>
</tr>
<tr>
<td>Move Left Sign</td>
<td>Placed 435’ upstream of portage on bank at 45°</td>
<td>Warning Dam Ahead Move Left For Portage</td>
<td>42”x34”</td>
<td>4”</td>
</tr>
<tr>
<td>Last Safe Exit Sign</td>
<td>Placed slightly upstream of portage on bank at 45°</td>
<td>Danger Dam Ahead Last Safe Portage Here Exit Now</td>
<td>40”x42”</td>
<td>4”</td>
</tr>
<tr>
<td>Drowning Zone Sign</td>
<td>Place upstream and downstream of dam on banks at 45°</td>
<td>17”x17”</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(2) Pedestrian Drowning Zone Warning Sign</td>
<td>Two signs placed inland north of the dam facing away from dam at pedestrian approaches facing inland</td>
<td>18”x24”</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
6C
SIGNAGE INSTALLATION
**Footing Reinforcing Data**

<table>
<thead>
<tr>
<th>Post Size</th>
<th>Stub Length</th>
<th>Footing Diameter</th>
<th>Footing Depth</th>
<th>Vertical Rein. Bar Size</th>
<th>Vertical Rein. Bar Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>W6x12</td>
<td>2'6&quot;</td>
<td>2'0&quot;</td>
<td>6'0&quot;</td>
<td>No. 6</td>
<td>5'8&quot;</td>
</tr>
<tr>
<td>W6x15</td>
<td>2'6&quot;</td>
<td>2'0&quot;</td>
<td>6'6&quot;</td>
<td>No. 6</td>
<td>6'2&quot;</td>
</tr>
<tr>
<td>W8x18</td>
<td>2'6&quot;</td>
<td>2'0&quot;</td>
<td>7'0&quot;</td>
<td>No. 6</td>
<td>6'8&quot;</td>
</tr>
<tr>
<td>W8x21</td>
<td>3'0&quot;</td>
<td>2'8&quot;</td>
<td>7'6&quot;</td>
<td>No. 8</td>
<td>7'2&quot;</td>
</tr>
<tr>
<td>W10x22</td>
<td>3'0&quot;</td>
<td>2'8&quot;</td>
<td>8'0&quot;</td>
<td>No. 8</td>
<td>7'8&quot;</td>
</tr>
<tr>
<td>W10x26</td>
<td>3'0&quot;</td>
<td>2'8&quot;</td>
<td>8'6&quot;</td>
<td>No. 8</td>
<td>8'2&quot;</td>
</tr>
<tr>
<td>W12x26</td>
<td>3'0&quot;</td>
<td>2'8&quot;</td>
<td>9'0&quot;</td>
<td>No. 8</td>
<td>8'8&quot;</td>
</tr>
</tbody>
</table>

**Figure 6C-1**

Single or Double Steel Post Installation

- **Top View**
  - Optional Bedrock Footing
  - Vertical reinforcing bars
  - Sign face
  - 1"x1" tubing for sign face reinforcement
  - Poured concrete footing
  - Sign post
  - Reinforcing hoops

- **Side View**
  - Top of footing formed to match grade slope
  - Horizontal reinforcing hoops, 3/8" thick, 12" maximum vertical spacing
  - Vertical reinforcing bars, 3/8" thick, 5'8" long
  - Poured concrete footing
  - Footing keyed into solid rock at least 3"
  - Pre-drilled holes twice the reinforcing bar’s diameter, filled with concrete, with reinforcing bar inserted

- **Reinforcement Data**
  - Reinforcement tubing, 1"x1" tubing 1/8" thickness
  - Equal spacing not to exceed 10" between reinforcement tubes
  - 3/8"-diameter 2"-long carriage bolts with nuts and washers
  - 3/8"-diameter, 6"-long carriage bolts with nut and washers
  - Structural steel sign post, 4"x4" tubing 1/4" thickness, or 4" I-beam
**Figure 6C-2**
Cartilevered Sign Installation

- **Square channel beam**, sized according to sign size
- **5'8" long (inner dimension)**
- **Square-channel angle brace**, sized according to sign size
- **Continuous-weld connection**
- **Steel I-beam**, sized according to sign size
- **3/8" carriage bolts with nuts and washers**
- **8" culvert sleeve filled with concrete**
- **55-gallon drum filled with concrete**
- **River bank**
- **48" x 1/4" rebar**

Water Surface
Figure 6C-3
Mounting Signs On Bridge Piers
Concrete Bridge Deck Sign Installation

**Figure 6C-4**

- Barrier wall
- Bridge travel surface
- Concrete bridge deck
- Side View Water flow
- 5/8" × 4" anchor bolts with nuts and washers
- 3/8" carriage bolts with nuts and washers
- Steel bar bent to 90° to form L-bracket
- Bridge sign
Figure 6C-5
Trestle Bridge Sign Installation

- **Trestle bridge frame**
- **Sign face**
- **¼" Steel cable tensioned at 45° from the 4 corners of the bridge frame**
- **Water Flow**
- **Side View**
- **Sign face**
- **Secure sign on ¾"×4" eye bolt with a lock nut and flat washer on each side of sign**
- **Thread cable through eye bolt**
- **3/8"×6" Eye to eye turnbuckle**
- **Use ¼" cable thimble to prevent cable from bending to tight at connections**
- **Two ¼" cable clamps at each connection with U-bolt resting on short section of cable**
**BIBLIOGRAPHY**

Elverum, K., personal communication, June 3, 2009.


Iowa DNR. 2003. Boat Ramp Design Guidelines. Iowa Department of Natural Resources, Des Moines, IA.


