NATIONAL PARK SERVICE

River Management Society

PREPARE TO LAUNCH!

Guidelines for Assessing, Designing, and Building Launch Sites for Carry-in Watercraft

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Update *Prepare to Launch!* Publication Acknowledgements:

Written by Joe Sullivan, an intern with the River Management Society in the summer of 2013 with assistance from Risa Shimoda, Executive Director of the River Management Society, and Lelia Mellen and Corita Waters, National Park Service Rivers, Trails and Conservation Assistance Program.

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Prepare To Launch!

Guidelines For Assessing, Designing And Building Access Sites For Carry-In Watercraft

Why This Document: To help facility and trail planners, and park and recreation project leaders when planning, building, or updating access sites that are tailored to the needs of the canoeists, kayakers, tubers, stand-up paddlers, rowers, or small craft sailors (commonly referred to as "paddlers" in this document). *Prepare to Launch!* will help with:

- **Understanding Launch Locations** by addressing shoreline characteristics along rivers, lakes, and bays
- **Addressing Users' Launch Needs** by looking at the various types of users and watercraft, amount of traffic, and accessibility needs
- **Understanding Launch Design Criteria** that can be shared with a contractor, engineer, or designer, depending on the complexity of the site
- **Promoting Your Launch Project** by offering tips to help make decisions about appropriate launch design and construction and by helping to organize examples that can then help gain community support and fundraising.

Logical Lasting Launches: Updated

Prepare to Launch! is an update to *Logical Lasting Launches*, a National Park Service publication that has been a reliable resource for river managers at the federal, agency, state, local, and community level across the country since 2004. Material in the original document provided the basis for this presentation. *Prepare to Launch!* utilizes decision-based links to guide users through the development process from conception to detailed design creation and making final construction choices for a launch. *Prepare to Launch!* is also available as an online resource at www.River-Management.org.

We are aware that there are some inconsistencies in this document. This inconsistency comes from the fact that there is not one single standard for launch development and multiple factors weigh into launch design. We intend for this guide to be used as a reference to help make informed choices for launch sites.

Prepare to Launch! is a joint project of the NPS Rivers, Trails, Conservation Assistance Program and the River Management Society. We are grateful for the collaboration of river users, managers, and professionals across the country for this updated resource guide.

Published 2014 by the River Management Society

How To Navigate *Prepare To Launch!*

- **Navigation Functionality**
  - On every slide, there are two icons,  that allow you to navigate back to the beginning of a chapter, or return to the Table of Contents.
  -  Clicking this button will take you back to the beginning of the chapter you are currently in.
  -  Clicking the 'home' button will return you to the Table of Contents.
  - The Table of Contents slide is hyperlinked to allow you to click the section you would like to navigate directly to.
  - User Accessibility Colored buttons like this are also clickable, taking you to the corresponding section.
  - **Note:** These buttons only work when viewing the PowerPoint in 'presentation' mode.

- **Glossary Terms**
  - When you see a word that is colored like the following example, cleats, it is a glossary term that is defined in the end of the document. On every glossary page, there is a return button,  that will take you back to the previous slide you just came from.

Table of Contents

Table of Contents, cont.

- User Accessibility
- Site Location Appropriateness
- Cost Considerations / Trade-offs
- Environmentally-friendly

There are four primary questions to answer in determining a best-suited launch site: How will access be achieved? Which site location is most appropriate? What type of funding is available? Which environmental issues must be addressed?

List of Figures

User Accessibility: Broad + Practical

Universal Design: Paddlers of all abilities want to launch and land smoothly without capsizing or damaging their watercraft. They need firm and stable surfaces that support their movements and sufficient space to accommodate the length of their watercraft during put-in and take-out.

Physical Launch Accessibility: Paddlers must be able to stabilize their watercraft during transition to and from the water. Climbing in and out can be especially challenging when there is significant height difference between seat levels and shoreline or when current or waves create chop.

Slope: As close to 5% as possible at water's edge. Stay below 8.33%, whenever possible.

Accessible launch area in a dynamic river setting with high banks at the Charles City, Iowa waterfront.

Ideal launch environment

User Accessibility Design Factors

Recommendations for designing a launch that addresses the need of paddlers with disabilities:

Height Above Water: Design the launch surface as close as practical to water level. If a dock is the only way to gain water access, have the decking be as close to the water level as possible.

Staging Zone: Allow paddlers to enter their boats parallel to dock, from the side, allowing paddlers "dry" access to side entry of their boats.

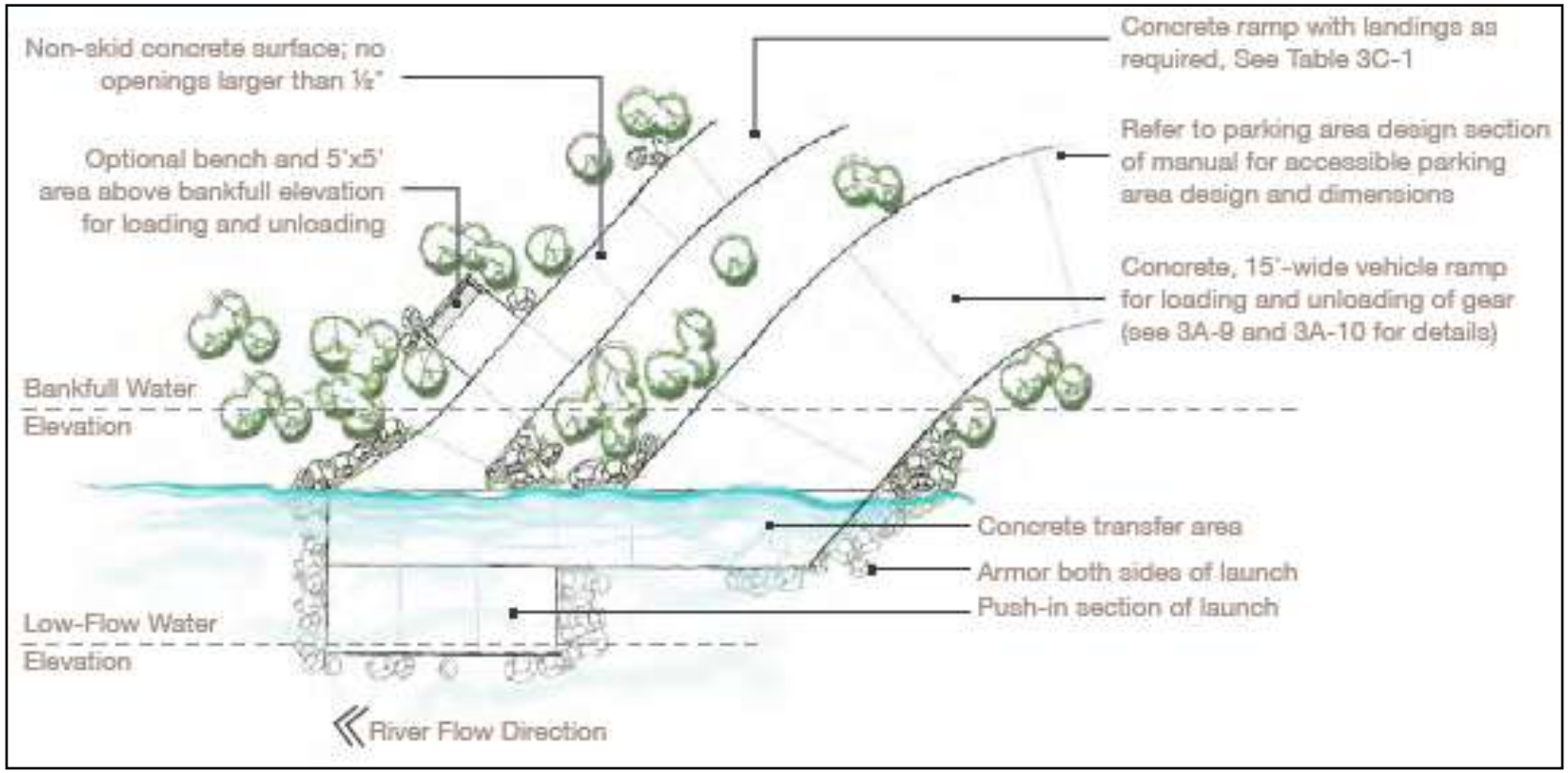
The area for Walking path/Staging area should be a minimum of 5', preferably 6' to 12' wide and long enough to accommodate the typical watercraft to be used at this site.

Example of a launch that is too high!

Biathlon Race Boat line up on Potomac River

Photo Credit: [Guidelines for Developing Non-Motorized Boat Launches in Florida]

User Accessibility: Universal Launch Design



Universal design practices seek to construct all facilities in ways that integrate users of varying abilities where possible.
Diagram from [Iowa DNR Water Trails Toolkit]

Site Location Appropriateness

The launch design that is chosen should be appropriate for the characteristics of your site. The type of water body as well as relevant climatic and ecological factors will all influence the launch choice. Choosing an appropriate site will enable the installation of a launch that is inexpensive, long lasting, and environmentally sensitive. The next slide describes what characteristics to look for in a site.

Poor Design: Steep slope, rugged terrain

Good Design: Wide, sturdy staircase

Site Location Appropriateness: 7 Site Location Characteristics for a "Best-Suited" Launch

1. Is constructed in accordance with applicable regulations, particularly the accessibility requirements.
2. Provides safe access away from potential hazards at various water levels and user conflict
3. Can withstand flow levels, currents, and exposure to elements
4. Designated with consideration for multiple types of users and carrying capacity of launch, parking, and waterway
5. Provides a firm surface for launching, despite changes in sedimentation levels
6. Will not be easily damaged due to climatic or seasonal conditions
7. Does not cause damage to riparian habitats or vegetation during construction and is unlikely to cause environmental impacts over time.

Site Location Appropriateness: Launch Design Selection Criteria

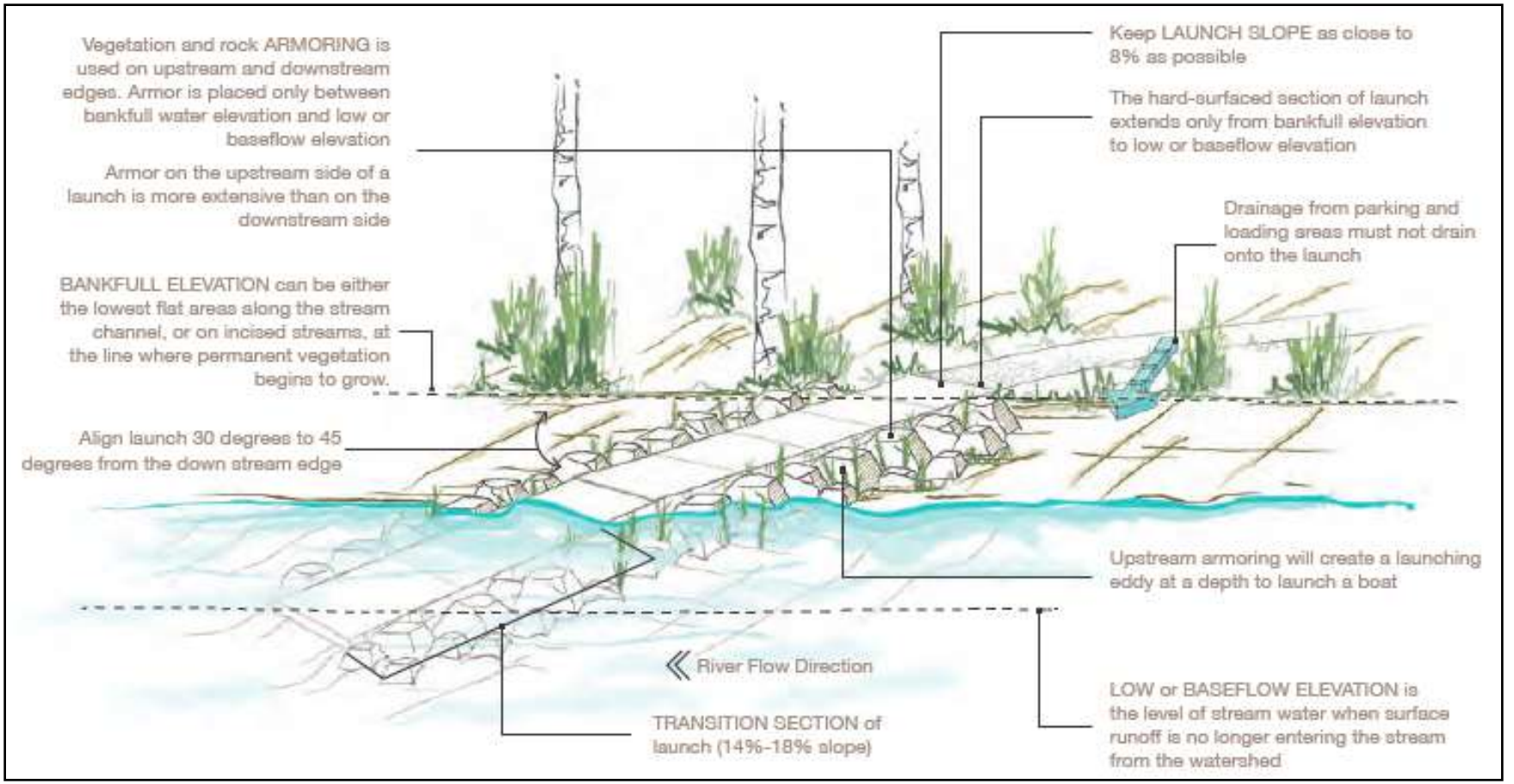
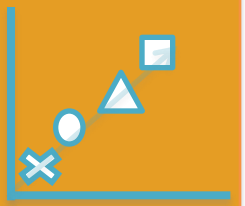


Diagram from [Iowa DNR Water Trails Toolkit]

Cost Considerations

The cost of your project will depend upon the complexity of your launch design. While you will want to keep your launch design as simple as possible, the potential for erosion, high use, and steep banks are just a few examples of factors that may require a more complex design, as well as materials and anchoring that go beyond your initial projection.

Complexity
vs.
Cost



Natural Design - most cost-effective, when possible.

The more complex, the more expensive!

Cost-Saving Design Tips

1. **Minimal Construction:** Keeps costs low and helps maintain a natural appearance along a shoreline. If construction is necessary, durable materials will reduce the need for later repairs or replacements.

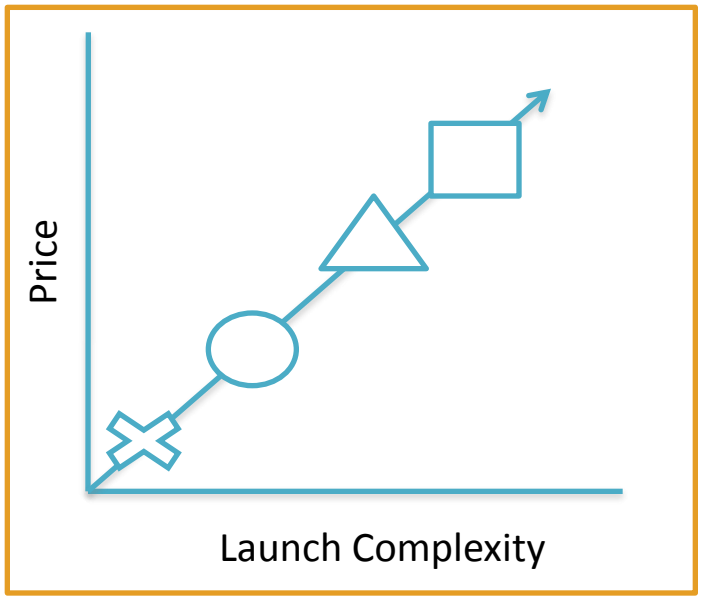
2. **Weathering Impact:** The speed at which materials weather will depend on climatic factors and level of exposure to currents and winds.

3. **Existing Structures:** In some cases, existing docks used by motorized boats can provide stable surfaces for paddle craft access, but many standard docks rise too far above the surface of the water to enable a safe and easy put-in for paddlers.

4. **Minor Modifications:** Some boat docks may be modified to make them more paddler-friendly, including being lowered, lengthened, or widened. Ramps can be made less steep or step-downs may be added with handrails, cleats, or windbreaks.

5. **Shoreline Features:** Features such as boardwalks can be combined with floating docks to enable the launching of hand-carried craft.

Launch Complexity vs. Cost



As complexity increases, so does cost. We have provided four launch examples that fall in different pricing tiers.

$ - Natural Surface

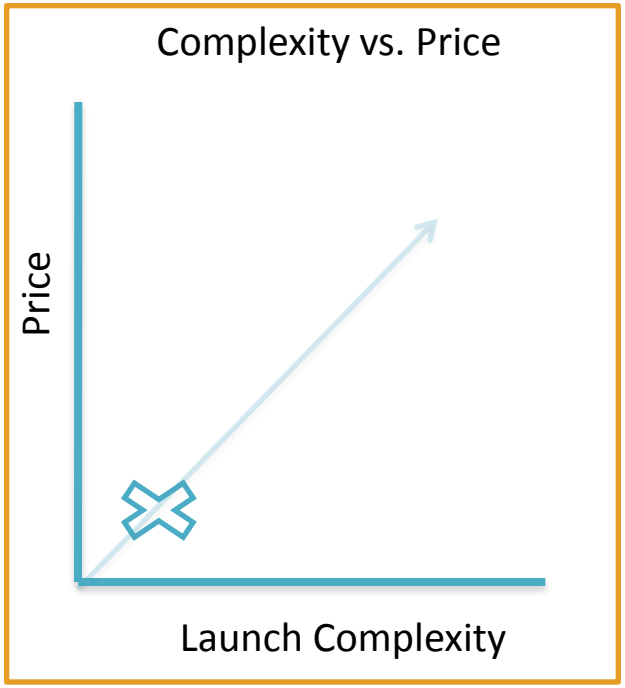
$$ - Natural Stairs

$$$ - Concrete Launches

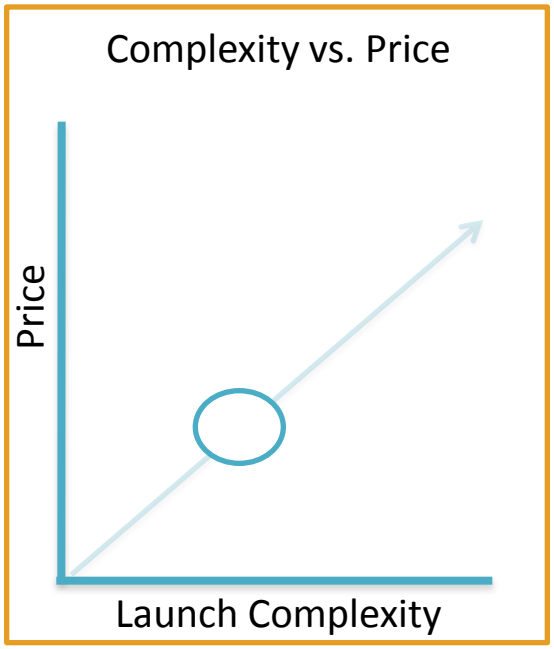
$$$$ - Steep or Urban Launches

$ - Natural Surface Designs

Natural surface designs are always the most cost efficient design choice and should be used whenever possible. Small additions to your site, as well as armoring the launch to protect it from the effects of erosion, can make a site more user-friendly. The boulders in the picture below offer such an example. The upstream placement of the boulders creates an area of calm water for the paddler to launch and helps prevent bank erosion.



$$ - Natural Stairs and Retrofits

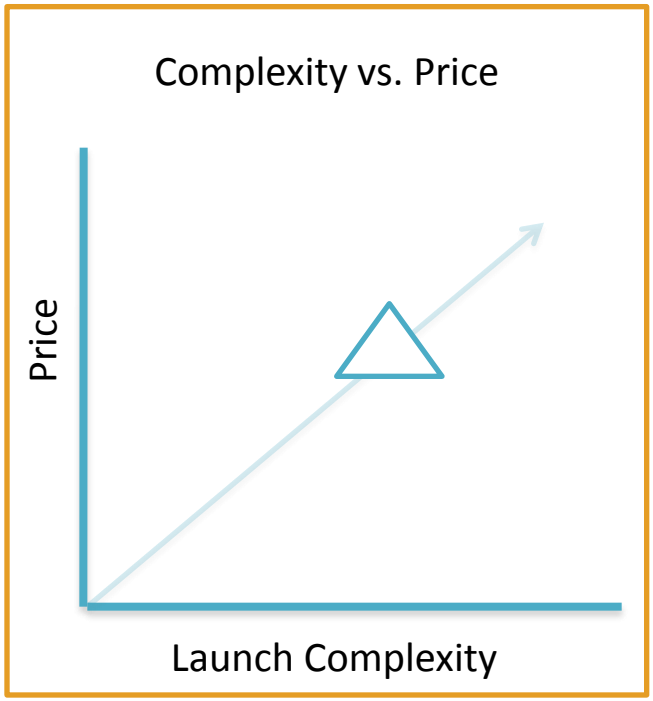


The steepness of the site might require a more complex launch design to provide safe access to the water. If you do not have the space to make a low-gradient ramp, stairs are an alternative solution for steep banks. Natural stairs are more complex and more expensive than a natural surface ramp. Using materials available on site such as the rocks in the image to the right can reduce construction expense considerably.

Installing launches in marinas such as the one in the image to the left may require a more complex design. This complex launch addresses heavy boat traffic while providing safe access from an elevated pier. Modifying an existing launch to be more paddler-friendly may be just as effective and less expensive!

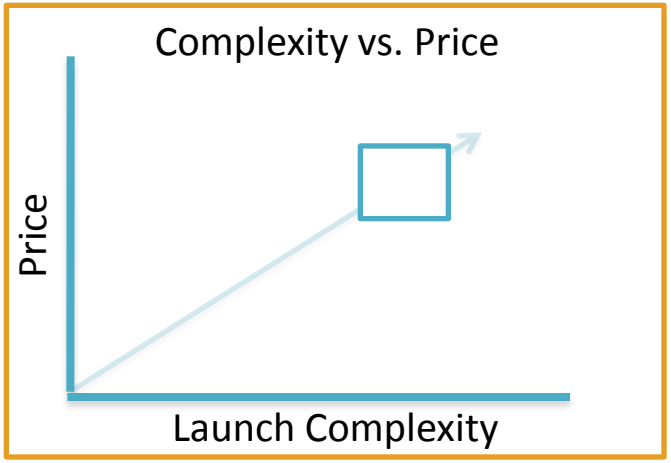
$$$ - Concrete Launches

Concrete launches provide an extremely stable surface for loading people and gear into a watercraft and sliding into the water. However, they also require heavy construction which can increase the price of a project. Concrete launch installation may require that the site be dry and coffer damming may be necessary. For a more cost efficient approach, precast concrete planks with a rail system do not require dewatering the submerged section of the launch.



$$$$ - Steep or Urban Launches

Some sites require launches that are extremely complex and expensive. Long steep slopes, like the site in the picture to the left, require large constructed staircases to provide access. One option when faced with steep banks is to look for another site where it will be less expensive to construct.



Urban launches present an array of unique challenges. The example to the left shows banks of the river with an aesthetically appealing natural look while still maintaining stability. Railings are necessary to prevent access in areas that are not safe.

Four Cost-Effective Design Recommendations: #1

Limit Construction: Use construction only when absolutely necessary. In many cases, an actual launch structure may not be needed; firm or sandy banks, level rocks, and beaches can often provide sufficient access.

Sturdy gravel beach on Nulhegan River, VT

Sandy Beach on Amelia Island, FL

Four Cost-Effective Design Recommendations: #2

Minimize Exposure: Choose access sites with minimal exposure to winds and heavy currents, preferably near calmer water, such as eddies. If this is not possible, consider creating a vegetative or other type of buffer to provide protection from the elements.

The example on the right exemplifies this minimized exposure launch.

Minimal exposure, natural surface launch on the lower Tuolumne river in California

Four Cost-Effective Design Recommendations: #3

Modify Existing Structures: To reduce construction expenses, modify existing boat docks or shoreline structures to welcome both non-motorized and motorized craft.

Example to right: Airboats use these wooden slats to 'dry launch' from a trailer but they are also utilized by paddlers to decrease hull damage from the concrete surface. Modify existing launch structures by adding wooden or PVC slats to make a launch non-motorized boat-friendly.

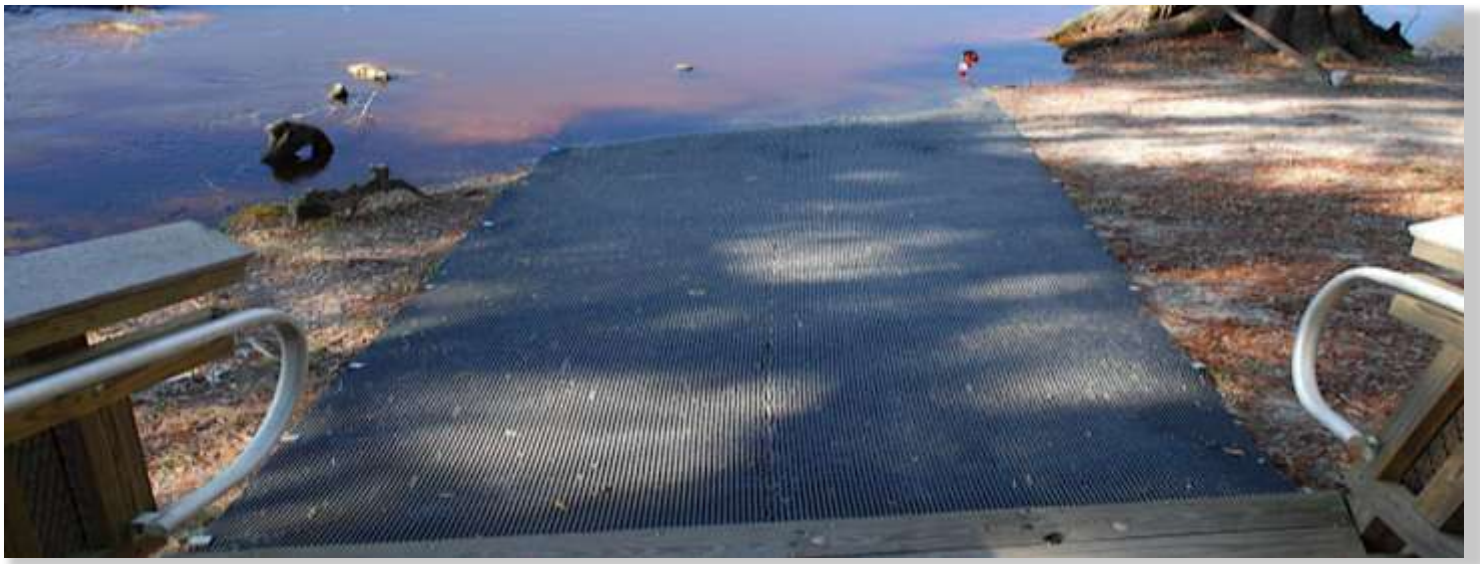
Note: If launch improvements are likely to create a traffic bottleneck at the launch site, consider widening the launch with features that appeal specifically to non-motorized users.

Photo Credit: Guidelines for Developing Non-motorized Boat Launches in Florida

Four Cost-Effective Design Recommendations: #4

Multiple Uses: Construct launches that serve multiple purposes, such as mitigating erosion or restoring wetland vegetation; simple ramps or implanted beaches may help to stabilize a fragile bank or provide “soft treatments” while also enabling access.

Example Below: Synthetic industrial matting is used to stabilize the surface on this launch along the Suwannee River. It can also be used to stabilize banks with a 2-4% slope and allows vegetation to grow through matting. It is anchored with 18-24” stainless steel pins and requires little maintenance. This launch is submerged frequently and has survived several flood events with no problems.



Humboldt Bay Trails, Arcata Marsh and Wildlife Sanctuary: Cost-Efficiency Study

Problem: The existing boat ramp is usable at only the highest tides, and at low tide the nearest channel is approximately 150 feet from the boat ramp (*see image below)*. In the past, the concrete boat ramp was used by motor-boaters backing their boats into the water, but the narrow window for high-tide access now generally prohibits motorized boating at this facility.

The existing floating portion of the dock, adjacent to the boat ramp is non-functional as it broke apart several years ago and is too short to be of use. Paddlers wishing to use the Marsh facility are generally forced to use the steep and slippery concrete boat ramp. The existing parking lot has recently been repaved and is approximately 24,000 square feet, but lacks any appropriately striped accessible parking. There is one portable ADA-compliant toilet on site at the north end of the parking lot.

Humboldt Bay Water Trails Implementation Program

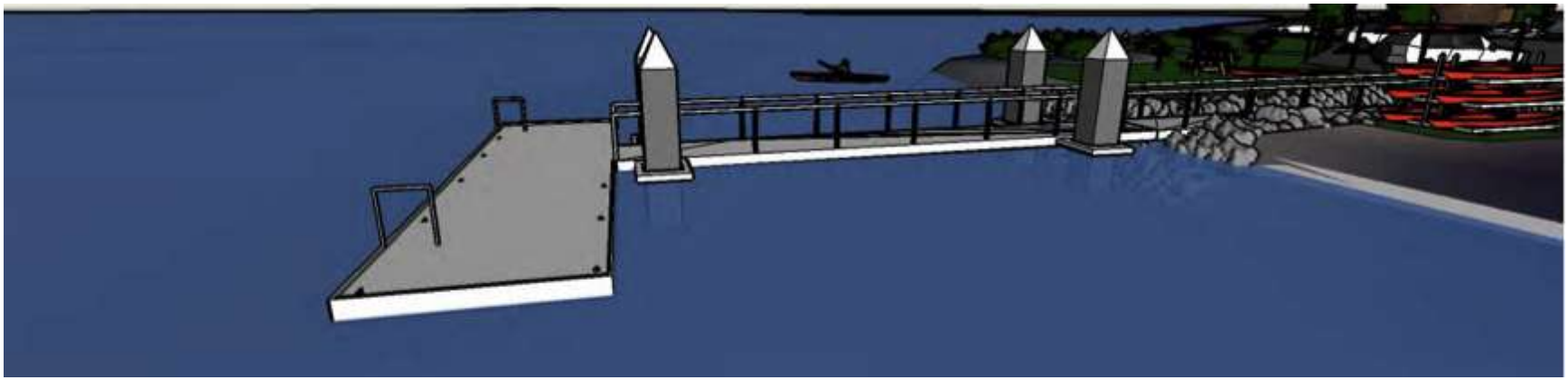
Humboldt Bay Trails, Arcata Marsh and Wildlife Sanctuary: Cost-Efficiency Study

Solution: The dock facility represented in the accompanying figures should provide non-motorized boating access at most tide levels. This conceptual dock design addresses issues with low tide access, and comments from regional boaters who have expressed concern for docks that incorporate 90-degree turns in order to comply with slope guidelines. The Arcata Marsh design increases the length of the dock to avoid turns. The dock design presented here extends to the parking lot edge. In this configuration, the dock slope is never greater than 8.33%.

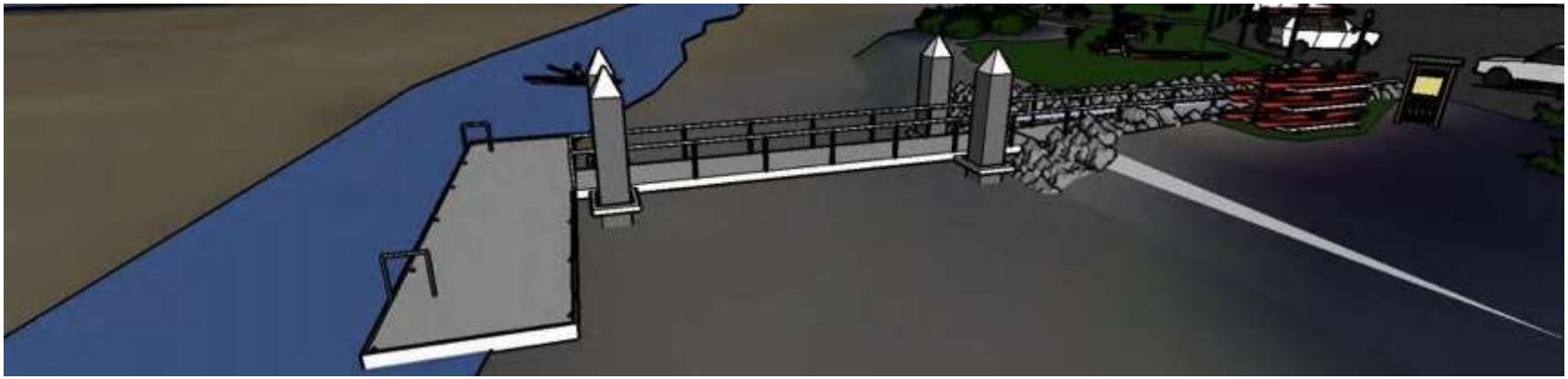
This conceptual design proposes using a polyethylene, snap-together, cell style of dock (such as one manufactured by Connect-A-Dock, Inc.) requiring very little maintenance and offering multiple configurations. The low profile cells are ten inches thick. Extra flotation is available in case more is needed, but it would increase the dock height. Also available from the manufacturer are accessories such as handrails, and wheel chairs can also operate on this material. The docks can support the expected load at the Arcata Marsh.

Humboldt Bay Trails, Arcata Marsh and Wildlife Sanctuary: Site Overview

Humboldt Bay Trails, Arcata Marsh and Wildlife Sanctuary: Profile of Dock

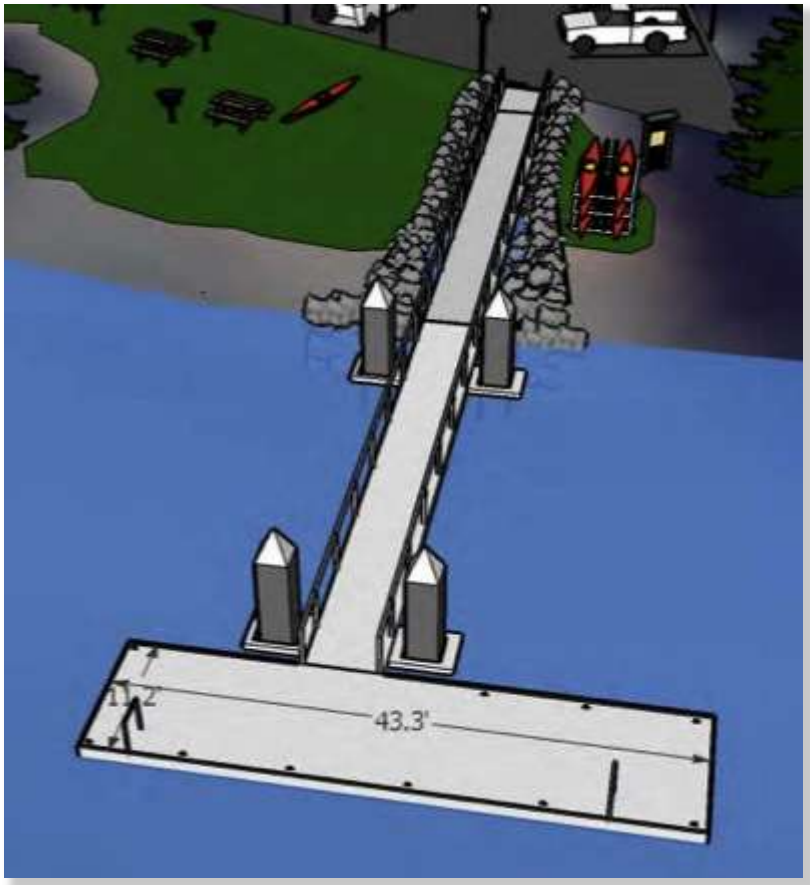


Profile of dock at high tide

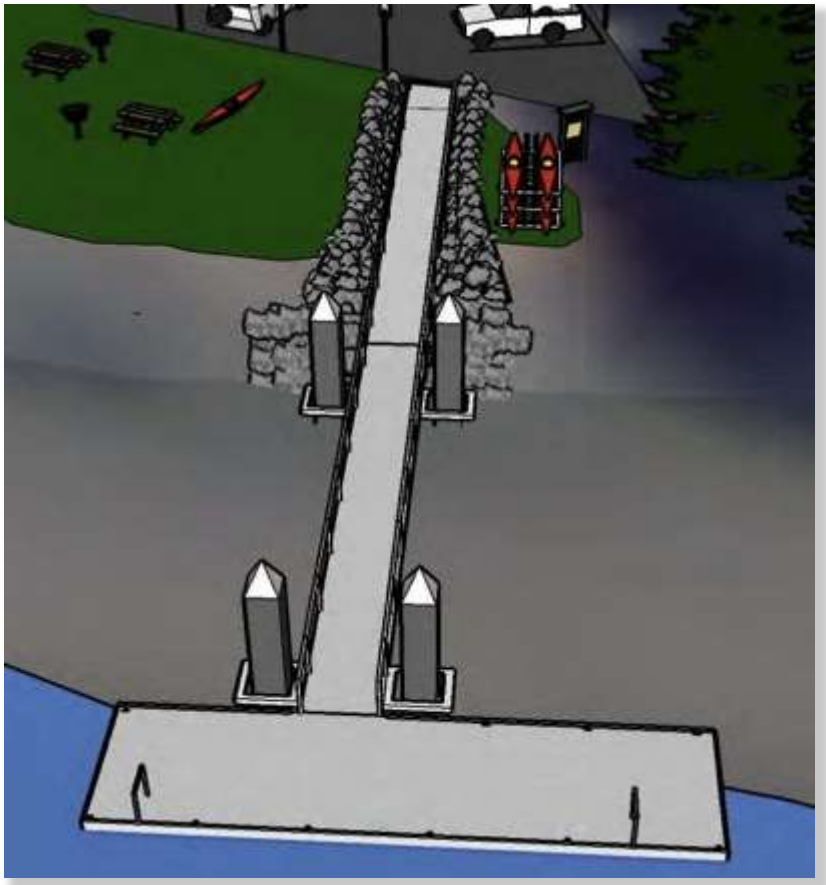


Profile of dock at low tide

Humboldt Bay Trails, Arcata Marsh and Wildlife Sanctuary: Planned View of Dock



Profile of dock at high tide



Profile of dock at low tide

Environmentally-Friendly Launch Considerations

Use of low-impact designs and non-toxic materials is essential to watershed health. Consider water quality and vegetation when providing sustainable recreation. There are usually environmental compliance requirements for projects on the bed and banks of rivers.

Existing Natural Site - Robinson Preserve, FL

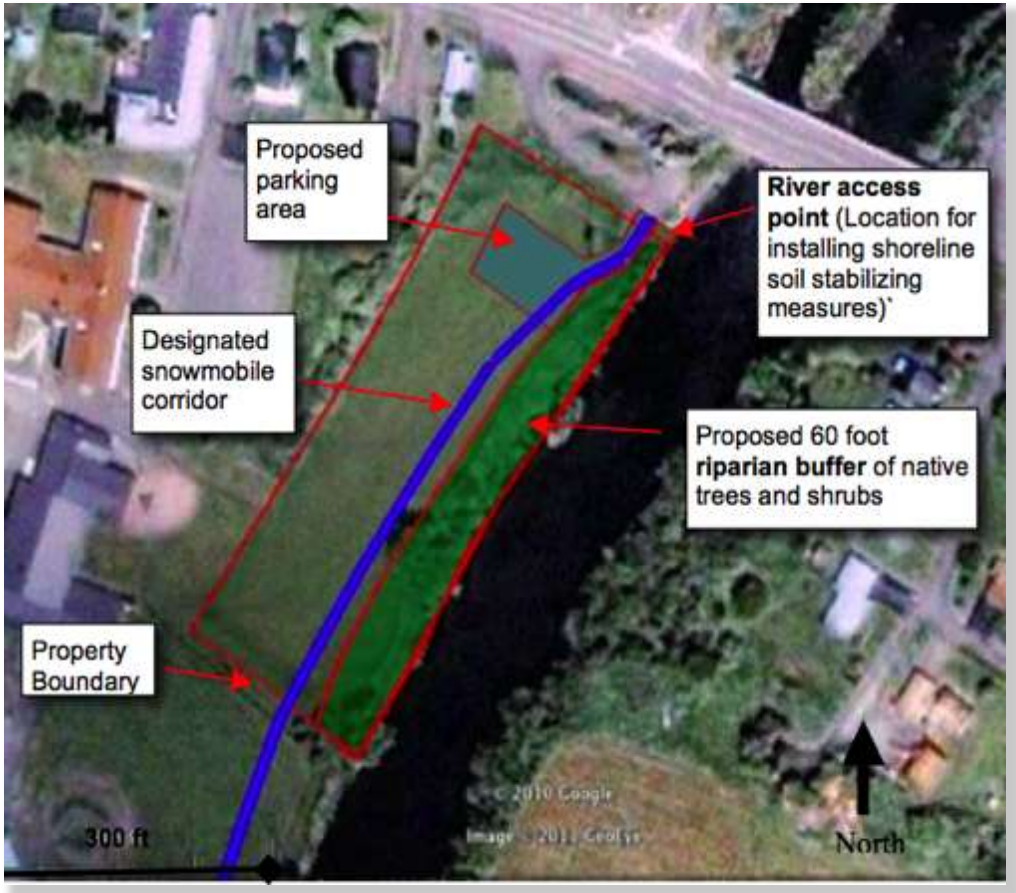
Photo Credit: [Guidelines for Developing Non-motorized Boat Launches in Florida]

Environmentally-Friendly Launch Recommendations

- Investigate applicable regulations; develop launch designs in accordance with these regulations.
- Use structures requiring minimal construction or alteration of the shoreline.
- Consult with a local natural resource specialist during the planning and construction phase to identify ecologically sensitive nesting sites, rookeries, spawning areas, or endangered species; an optimal put-in site may not be feasible for ecological reasons.
- Merge the needs of natural functions and the desired recreational uses of the water; with rivers and streams, avoid making any channel modifications and preserve in-stream habitats as much as possible.

Erosion can be prevented with good siting and proper access design.

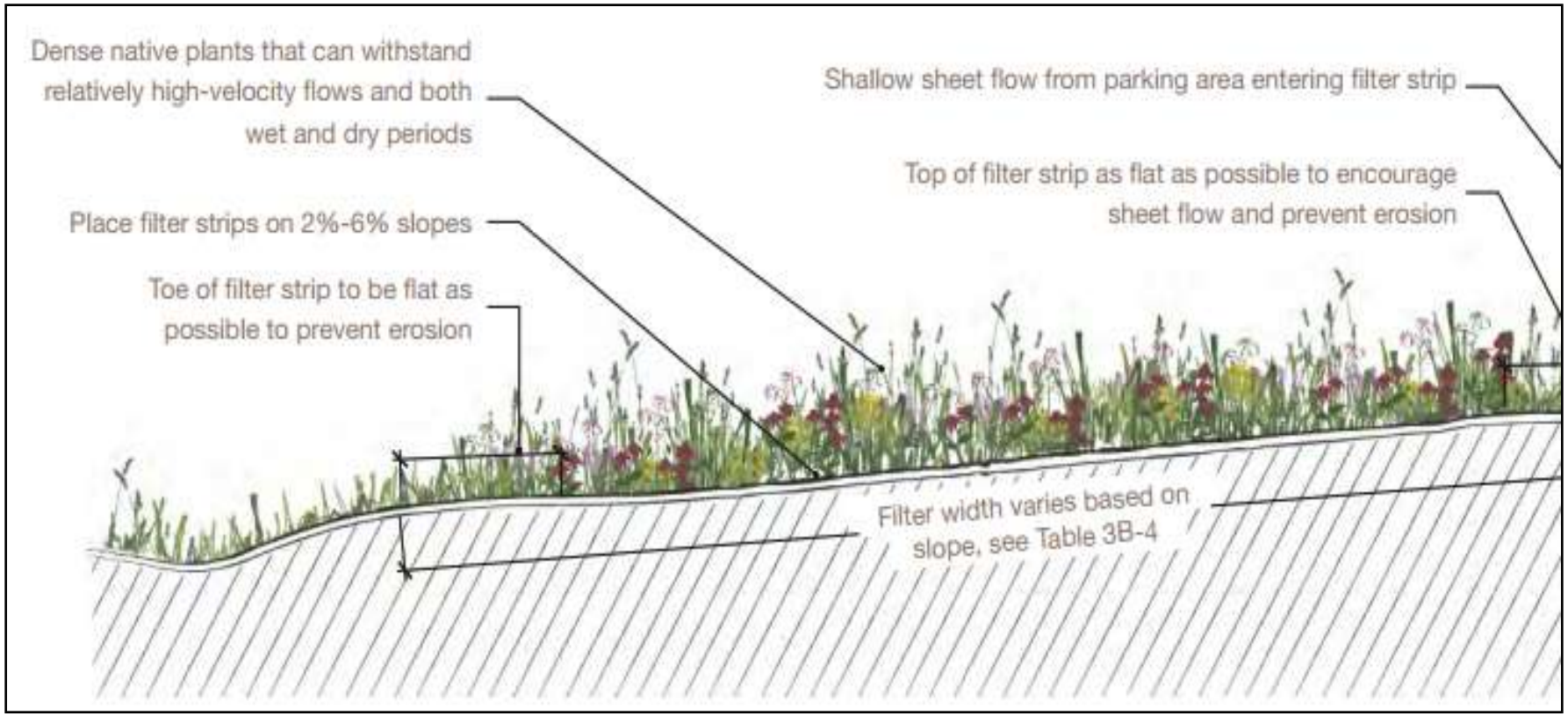
Environmentally-Friendly Launch Recommendations, cont.



A riparian buffer planted with native species to provide wildlife habitat and to protect water quality on the Connecticut River in Canaan, VT

- Monitor watershed conditions and changes in stream morphology.
- Gather data from local or state agencies that monitor water levels and flows to develop a launch that will accommodate the conditions of the water body.
- Avoid using hard reinforcements (e.g. concrete, steel, rock) where shorelines are eroding. Instead, use bioengineering methods, such as developing a riparian buffer planted with native species, to protect vegetation and habitats and stabilize shorelines while sheltering the launch area.
- Avoid using toxic or hazardous materials, or items that have contained these materials, wherever possible.

Environmentally-Friendly Launch Recommendations: Filtration Design – Vegetated Filter Strip



In areas where the seasonal water table is < 4' deep, there is frequent flooding, and the slope is > 15%, the vegetated filter is a great way to minimize impact to water resources at a launch site.

Diagram From [Iowa DNR Water Trails Toolkit]

Bibliography/Resources – Chapter 1

References

- Iowa DNR - Iowa Water Trails Toolkit
- Florida Fish & Wildlife Conservation Commission - Guidelines for Developing Non-motorized Boat Launches in Florida
- ADA Standards for Accessible Design
- Humboldt Bay Trails Cost Study - http://www.nrsrcaa.org/baytrails/
  http://scc.ca.gov/webmaster/ftp/pdf/sccbb/2010/1008/20100805Board3D_Humboldt_Bay_Water_Trail_Ex2.pdf
- NOAA Buoy Data - http://www.ndbc.noaa.gov/
- American Canoe Association – http://www.americancanoe.org / 'Adaptive' tab

Photo Credits – Chapter 1

Photo List

Slide 10: Charles City waterfront in Iowa, Nate Hoogeveen, Iowa DNR

Slide 13: Courtesy of the National Park Service

Slide 16: Courtesy of the National Park Service

Slide 19: Courtesy of the National Park Service

Slide 20: Courtesy of the National Park Service

Slide 20: Courtesy of the National Park Service

Slide 21: Trestle View Park, Winnipesaukee River, Franklin, NH – Charlie Tracy

Slide 22: Courtesy of the National Park Service

Slide 22: Courtesy of the National Park Service

Slide 23: Left Image - Courtesy of the National Park Service

Slide 23: Right image - **Guidelines for Developing Non-motorized Boat Launches in Florida**

Slide 24: Courtesy of the National Park Service

Slide 26: **Guidelines for Developing Non-motorized Boat Launches in Florida**

Slide 27: **Humboldt Bay Water Trails Implementation Program**

Slide 33: **Guidelines for Developing Non-motorized Boat Launches in Florida**

Slide 34: **Guidelines for Developing Non-motorized Boat Launches in Florida**

STEP 1:
Launch Location

STEP 2:
User Assessment

STEP 3:
Launch Development Considerations

To create an effective and sustainable launch, consider the following: launch location and the characteristics of the water body; the types of users accessing the launch and the craft they will use; and the permits and fundraising efforts needed to move the project forward.

List of Figures and Case Studies

Step 1: Launch Location
Assessing Your Site Options

Launch Location: Bodies of Water

Design for Environmentally Sensitive Areas

Design for Fluctuating Water Levels

Launch Location: Site Characteristics

Whether or not a launch will be effective and provide sustainable access depends largely upon its location; the characteristics of the water body (which may change between launch points); how the launch is used; and the skill and expectation of users.

Access is preferable in areas featuring:

- Low exposure to strong currents and wind such as an eddy, or in a cove or inlet
- No physical barriers such as dams or weirs
- Distance from other boat traffic, so that paddlers do not have to cross heavy traffic areas
- Adequate water levels
- Good water quality
- Little lateral movement that could erode the riverbank
- Visibility from both river and shore

Exposure to unsafe, unpredictable high flows that do not support boaters any time of the year.

Launch Location: Bodies of Water

Rivers

Whitewater: Class 1+

Coastal Waters

Lakes

Launch Location: Rivers

Building an effective launch will depend on a river's individual characteristics and on a range of topographic, ecological, and climatic factors. Stream channel patterns are impacted by stream flows, sediment deposition, climatic conditions, and landforms. Bank erosion rates, bed stability, slopes, riparian vegetation and habitats also affect a river's structure and behavior. Similarly, no two points along a river are the same. Rivers change character along their courses and over time; occurrences on one segment affect what happens downstream.

Rivers: Aerial View of River Morphology

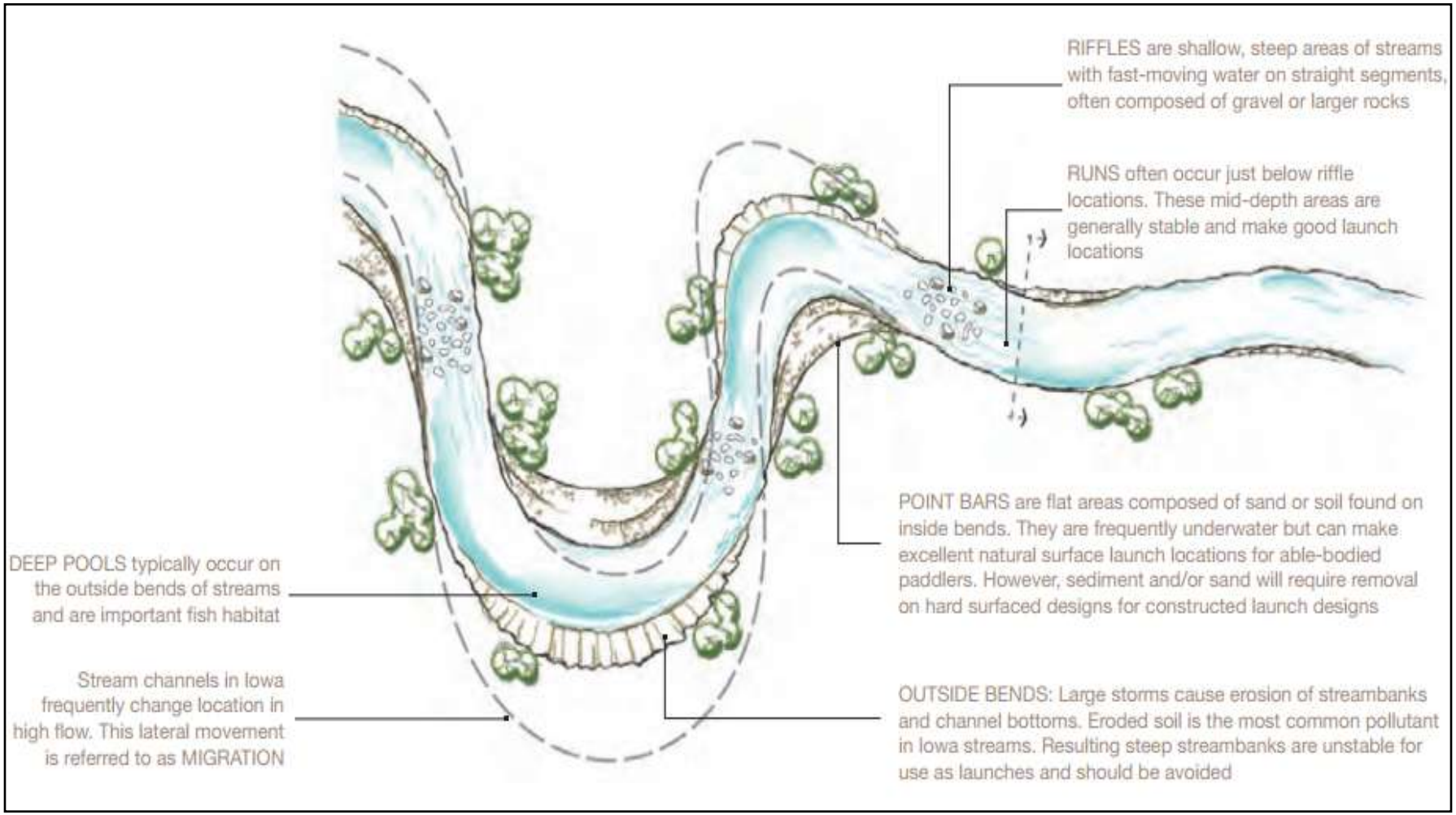


Diagram from [Iowa DNR Water Trails Toolkit]

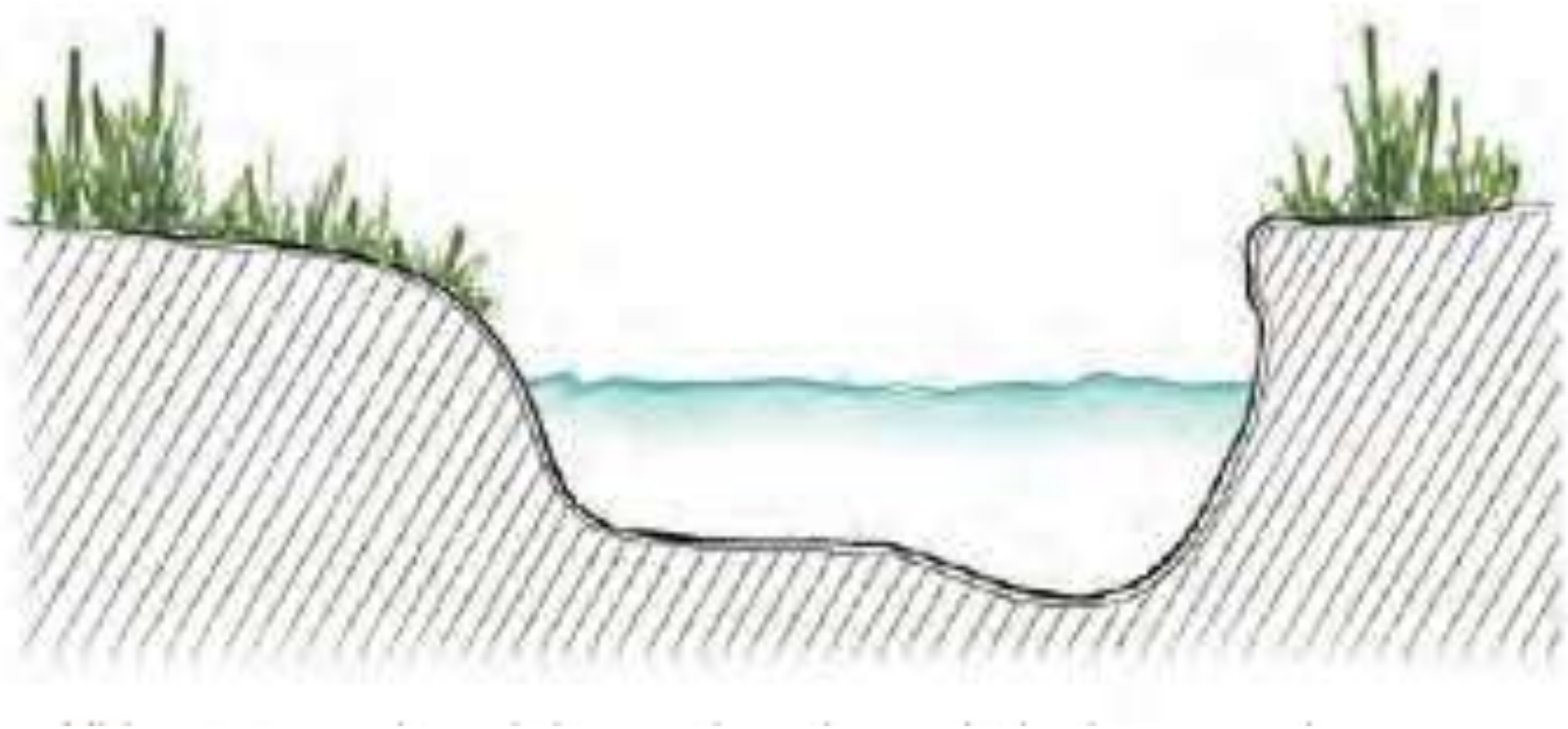
Rivers: Morphology

Meander bends on large floodplain rivers may be temporary features, given the dynamic nature of flows; therefore, launch design should take into account possible channel migration over time. Aerial photos over a period of years may be available from the U.S. Geological Survey (USGS) and can be helpful resources in analyzing channel migration.

Areas of heavy flow should be avoided as they will cause wearing on the site over time and can be hazardous to paddlers. Having some movement in the water, however, may prevent excessive sediment accumulation that could cause a canoe or kayak to get stuck. Ideally, there would be a moderate level of deposition that forms a natural beach area suitable for launching.

Federal and state government agencies, such as U.S Geological Survey, the U.S. Army Corps of Engineers, and state water surveys, can usually provide information on average water levels. These are important statistics to know before constructing a launch on any site.

Rivers: Least Suitable River Launch Site

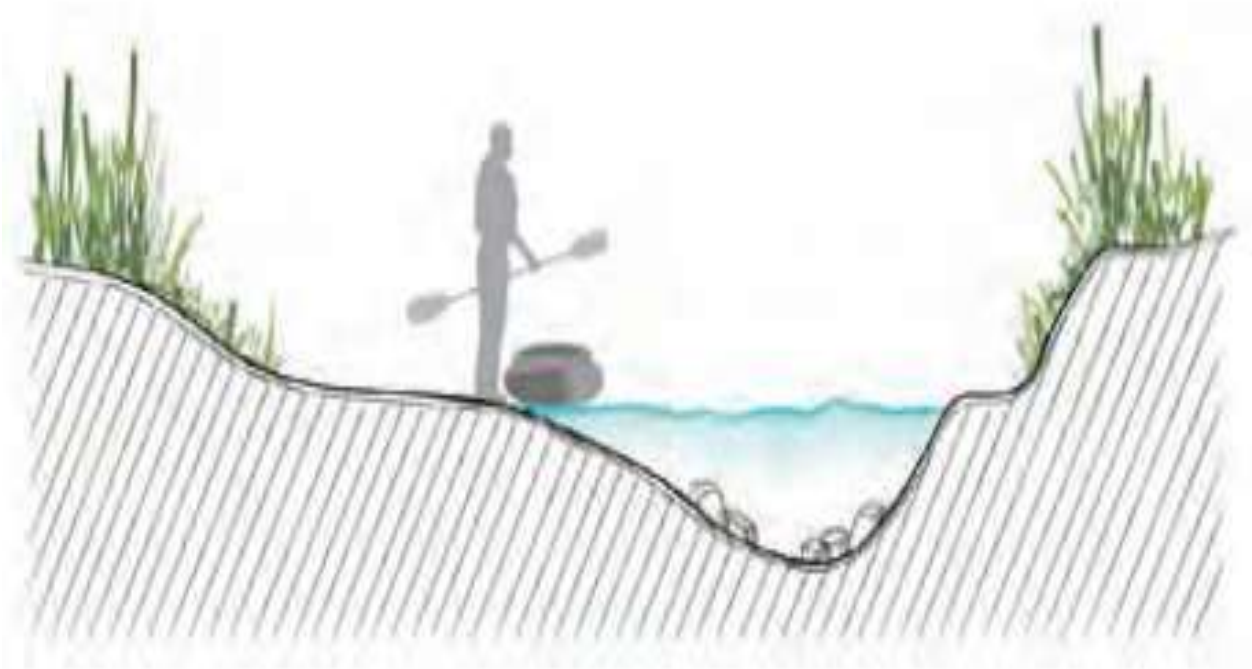


The steep banks of this stream make it the least suitable site for a launch, as it would be vulnerable to a great deal of erosion of the already unstable surface. If there is no other site option, an elevated launch design will help you bypass the unstable surface.

Diagram from [Iowa DNR Water Trails Toolkit]

Rivers: Ideal River Launch Site

This is an example of an ideal 'natural surface' launch site on a river. The gradual slope on the left side of this diagram provides easy access at various water levels. Gradual slopes also provide easy access for wheel chairs as long as the surface is stable. Vegetative buffers on both river banks help prevent erosion.



Some segments are more stable, with the bank on one side more gentle and the other side steeper. These segments offer both shallow and deeper water areas. The shallow side of a stream is often an excellent location for launch construction. Ensure sediment and/or sand deposition is not an issue before constructing launch.

Diagram from [Iowa DNR Water Trails Toolkit]

Launch Location: Whitewater

- This guide uses whitewater as Class I and higher rapids. See the definition by American Whitewater's ***Whitewater Safety Code and International Scale of River Difficulty***.
- A river rating takes into account many factors including the difficulty of individual rapids, remoteness, hazards, etc; similar to how a whitewater launch should consider those same factors.
- Due to seasonal changes or dam releases, some rivers experience dramatic differences in flow and water levels. These rivers require launch areas that can withstand extreme fluctuations and accommodate paddlers in a wide range of circumstances.

Whitewater: Example 1

Access on whitewater rivers is preferable near eddies or calmer sections. Natural shoreline areas that can be reinforced easily and inexpensively are typically the best places to launch.

Consider the type of craft, number and types of people who will use your launch. A 5' width path may be appropriate for use by paddlers carrying short kayaks, while rafters may need 12' to accommodate people carrying boats from both sides. Multiple groups beginning or ending multi-day trips require a considerably wide launch area.

Level beaches, flat rock outcrops, and sturdy banks may be sufficient. Structures such as concrete stairs may need to be designed to withstand heavy flows and ice without causing erosion. Concrete or other material can be used to divert runoff from a launch area.

Concrete Staircases on the South Platte River, CO

Whitewater: Example 2

Banks adjacent to bridges may provide consistent access during changing flows. Access from the road to these areas is often convenient, and the armoring used to protect bridges can also protect the launch area.

Staircase launch adjacent to bridge on the Harpeth State Scenic River in Tennessee

Whitewater:
Launch Site Needs Improvement

Tuolumne River launch: too steep for boats, people, and is causing erosion and bank destabilization

Whitewater:
Ideal Launch Site

Firm natural launch design preventing erosion on the Boise River

Launch Location: Coastal Waters

As with rivers, access along coastal waters is preferable in areas protected from waves and wind. Tidal water bodies experience dramatic changes in water level; a deep channel can become a muddy flat within a period of hours. Tidal changes can pose risks to paddlers when rocks or other hazards are exposed in lower water levels.

Launches need to be built to withstand tidal fluctuations and possible impacts caused by floating debris or aquatic life carried in or left behind by tidal currents. Materials used to construct launches should be salt-resistant.

Cape Cod Coastal Launch

Coastal Waters: Example 1

Vegetated banks with informal launch and take-out sites can be fragile and subject to trampling by paddlers, who may be unaware of their impact. As seen below, rocks or other natural materials may be placed in a way that directs paddlers toward specified launch areas and paddlers can be educated about their impacts. Natural grasses along these banks can help control erosion and preserve habitat.

Dinner Key Marina in Miami, FL uses limestone boulders to help funnel traffic away from the surrounding marsh shoreline.

Coastal Waters: Example 2

Environmental factors specific to salt water areas should also be considered when choosing a launch location or type, such as the level of sunlight needed by marsh and marine grasses. Structures that block light may prevent vegetation from receiving sufficient light for growth. Additionally, using piles or other support structures on sandy estuary bottoms may cause sediment displacement.

Desired natural surface design launch at Merritt Island National Wildlife Refuge in FL.

Coastal Waters:
Launch Site Needs Improvement

The stairs above are too narrow and are troublesome at low tide.

Coastal Waters: Ideal Launch Site

Alviso Marina Boat Launch in Santa Clara County, California

Launch Location: Lakes

Launch structures may not be needed on lake sites where shorelines are not exposed to heavy currents and fluctuating water levels. However, it is still recommended to locate access sites in relatively protected areas with minimal exposure and erosion problems.

Shallow, marshy areas should be avoided, as they are difficult to navigate and likely to host fragile wetland ecosystems. Lakes can vary greatly in size, character, and behavior. The Great Lakes, for example, behave like tidal water bodies. Launch sites suitable for coastal areas should be considered in these areas.

Anthony Lakes small, concrete single-lane boat ramp in Oregon

Lakes:
Launch Site Needs Improvement

The Sunshine Bottoms boat launch on the Lewis & Clark Reservoir in Nebraska suffered from freezing and thawing breakages before it was reconstructed with a concrete ramp mat.

Lakes:
Low Impact Launch Site

Echo Lake, MN boat launch with minimal alteration to the shoreline

Design For Environmentally Sensitive Areas

- Avoid developing launch sites in environmentally sensitive areas.
- So, what do you do if you have **no** alternative access points?

Fort Clatsop Historic Canoe Launch

Design For Environmentally Sensitive Areas: Launch Design Types

Both elevated walkways and geotextile launches are recommended for these sites. If implemented correctly, these designs allow for vegetative growth to continue unimpeded by the installation of the launches. Although these launches are designed to allow vegetative growth, construction can have a large negative impact on the riparian zone of a river. This is why developing launch sites in environmentally sensitive areas is strongly discouraged.

Alviso boat ramp in Santa Clara County, CA was awarded the 2010 US Recreational Boating Access Award in part for its success in catering to its environmentally sensitive area.

Design For Environmentally Sensitive Areas: Materials

The choice of materials used to construct launches is particularly important in an environmentally sensitive area. Materials that require little onsite alterations and are least toxic are the most preferable for these sites.

A natural resource specialist should be consulted during the site planning, construction and maintenance to assure the integrity of the shoreline is not jeopardized along with the quality of the water.

Environmentally Sensitive Launch Design Case Study: Fort Clatsop Historic Canoe Launch

The Fort Clatsop historic canoe launch at the Lewis and Clark National Historic Park along the Columbia River near Astoria, Oregon, is an example of a site located in an environmentally sensitive area that cannot be moved, given its role in the historic and cultural landscape. Fort Clatsop was the site from which Lewis and Clark launched on their return journey east in 1806. Moving the launch would alter the site's historic accuracy, as well as the vistas important to the character and experience of the site.

The launch is used primarily for display purposes and is not open for public use, but the environmental challenges posed at this site resemble those at many public launches.

Fort Clatsop Historic Canoe Launch: Overview

Problem: Situated on an exposed area of a tidal river, the main challenges to the longevity of the launch are impacts of erosion, wind, and heavy flows. Additionally, due to its location on a bend of the river, the landing is vulnerable to lateral flows caused by the dramatic changes in direction and curvature on this part of the meander

Solution: Through detailed site analyses, assessments were made of the site that accounted for current and future trends in channel morphology and behavior, as well as the effects of sedimentation and erosion patterns. Due to the vulnerability of the canoe landing's location and exposure to strong winds and currents, it was determined that this site needed "erosion resistant features," such as a vegetation buffer, to offer protection and stabilization to the landing.

A beach area on the south side of the landing has been designated as a public launch site. The site may not be used at all times due to the tides. Paddlers may launch at high tide only, as the area becomes too muddy for launching at low tide. Paddlers carry their boats to the beach site while walking on a concrete path from a parking area located just north of the site.

Fort Clatsop Historic Canoe Launch: Site Details

Turfstone, see the image to the right, is a concrete mat that controls erosion and stabilizes the landing. The problem with the launch prior to this project was that silt had built up at the toe, creating a muddy area with a perceived drop off with some large rocks acting as tripping hazards in the murky water. Additionally, an uneven surface and erosion were caused by water from the upland side of the ramp and parking lot draining down the ramp in heavy precipitation.

Fort Clatsop Historic Canoe Launch: Site Details 2

Managers were able to minimize costs in design and construction, as well as environmental impacts. The minimal earthwork to even out the toe of the ramp and install the Turfstone could be done at low tide conditions when dry, avoiding the need to build a cofferdam and de-water. The Turfstone's voided mat design allows for vegetation to grow up through the mat and further prevent erosion. During construction, the steep slope was reduced. This type of mat will simplify silt removal, reducing future maintenance time.

The drainage upslope from the ramp will be combined with roof drainage from the nearby kayak shed and diverted to flow into a rain garden/wetland area.

Design For Fluctuating Waters

- High/low flow rivers can change character dramatically when water levels fluctuate due to seasons or rainfall. Rocks, snags, low trees, and other hazards may be disguised during high flow, making them difficult to see and avoid; they may also be dangerous to paddlers at low flow. Some rivers turn into mud flats during low flow, making access nearly impossible unless there is a firm surface with sufficient water depth for launching.

- Natural surface designs are the most ideal for launches in areas of fluctuating water levels. A low sloping beach provides a perfect adaptable access point at various water levels. If no site similar to this is available, consider a floating or pile-supported launch. If you choose a built launch, the water level must remain below the height of the deck at all times.

- Federal and state government agencies, such as U.S Geological Survey, the U.S. Army Corps of Engineers, and state water surveys can usually provide information about average water levels. These are important statistics to know before constructing any launch.

Design for Fluctuating Waters Case Study: Lynches River, South Carolina

This launch design provides access at various water levels. The top picture shows a low level day when the path provides access directly to the river. The bottom picture shows the river on a high level day when the concrete stairs provide easy access to the river.

Photo credit: Mary Crockett

Step 2: User Assessment

- Types of Users and Watercraft
- Level of User Traffic
- Accessibility Needs

Types of Users

Who are you planning for? Identify users and ask the right questions!

Your visitors may include paddlers carrying touring kayaks two at a time from the bow and stern; teammates unloading, lifting and launching 30' rowing shells; or customers unloading and carrying inflated rafts from both sides. Launches that greet multiple groups beginning multi-day trips require a very wide area, and if users start and end trips there you can expect use throughout the day.

Potential Partners: Involve paddlers, kayak anglers, rowers, rafters, standup paddle boarders, small sailboat owners and others of all abilities in early planning stages. They may have offer simple, cost-effective ideas to help create a successful design. Locals groups may also be interested in helping to maintain access and raise funds for the project.

Types of Users: Paddlers and Kayak Anglers

Features for Paddlers and Kayak Anglers

- Design short distances from parking area to launch or provide option for users to unload boats and gear near launch area and park remotely. Overnight parking is a plus for anglers and long-distance paddlers.
- Concrete ramp surface is damaging to the hull of boats being launched by hand. When no existing firm surface is available consider rubber matting, synthetic products, or other surfacing options.
- Design vehicle loading in-line with the launch, circular driveways become congested easily.
- In multi-user sites provide some parking for vehicles with and without trailers. Outfitters may have large vans or buses and long trailers.
- Provide secure storage, see picture to the right.

Kayak storage facility

Types of Users: Rowers

Launch & Parking Features For Rowers

•Floating docks must be stable for rowers with a minimum dock length of 45 ft. and height of 5-6” above the water. No dock posts should be present.

•Rowers need large parking and turning areas to facilitate length of crew boats trailers which are 76 ft. long.

Types of Users: Small Sailboats

Preferred Launch and Parking Features for Small Sailboats

- Overhead power lines, trees, bridges, and other structures that may be fine for other watercraft users pose hazards for sailors in both launch and parking areas.
- Sailors need adequate room for parking trailers.
- Hardened sand or small gravel are suitable surfaces for most small sailboats to launch.

Types of Users: Amenities for All

Amenities that are Appreciated by All Users

- Restrooms
- Fresh water to rinse boats/gear
- Trash cans
- Picnic area
- Maps or navigation guides

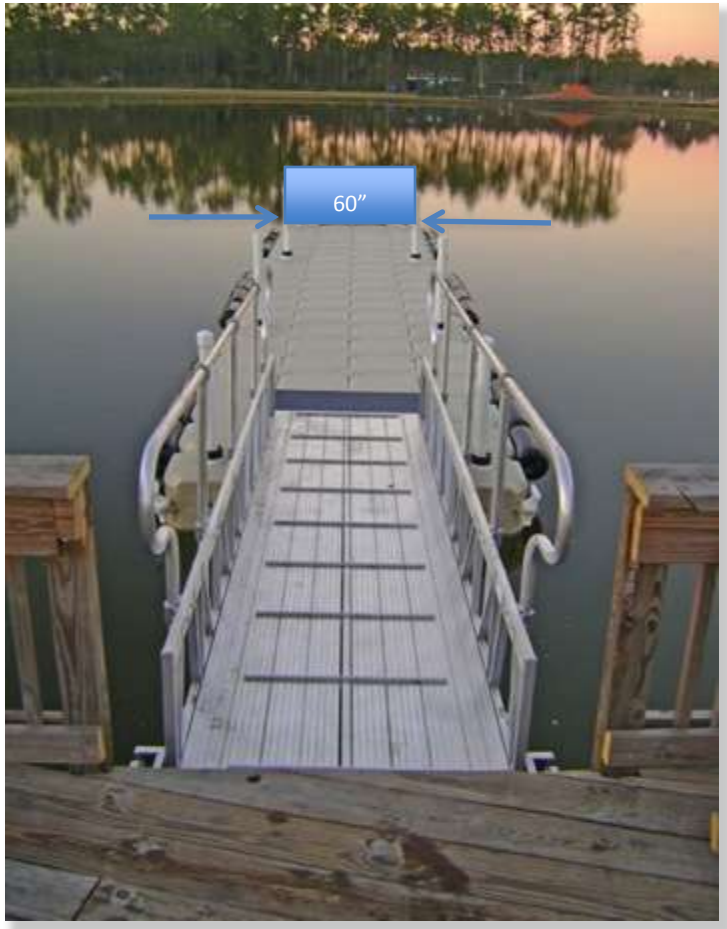
River Breeze Park, FL (to the right)
Parking – Free parking for all vehicles. 24 hours access with overnight parking.
Launch – Beach area launch with gentle slope into water. Out of the way of the motorized boat launch area.
Portage to Launch – You are able to unload your boat and gear near the launch. The parking lot is located about 350 feet away.
Amenities – Restrooms, showers, picnic tables, grills, fresh water, shade trees.

Types of Watercraft: Accessibility Considerations

Kayakers may prefer a natural surface while row boat owners prefer a dock. A launch site may be more frequently used by one type of craft, but it is a best practice to accommodate as many types of vessels as is practical.

ADA Standards for Accessible Design include the following, geared toward traditional docks and piers (this may apply to marinas that would like to better accommodate carry-in craft):

- A floating *boarding pier* must have clear space 60" wide minimum.
- Every 10 feet of linear pier shall have at least one continuous clear opening a minimum of 60" wide unrestricted by railings. Railings are not required.
- 36" wide docking is acceptable as long as the 36" wide docking is no longer than 24" long and has 60"x 60" docking on either side.



Types of Watercraft: User Experience Levels

Consider the skill level(s) of the people most likely to use your launch site, for their level of experience should influence the type of launch chosen. If a site is a frequently used by beginner boaters, the launch design should take this into consideration.

Although the natural surface launch in the picture may look like a perfectly good site to an experienced boater, a beginner may not even recognize the site as a designated spot to launch their boat.

Level of User Traffic: How Often Will the Launch be Used?

- To construct an appropriate launch site a designer should have a thorough understanding of the expected level of use that the launch will have on a daily basis, particularly at peak times. If a site is known to be a popular point of access to the water, then a plan for a launch that will accommodate multiple users at the same time must be made. Wide natural surface launches are most effective at this.

- The volume of traffic is something that should be considered throughout the entire developmental stage of a site. This will affect how many parking spots are provided, how wide the access trail is, and how many portable toilets are on site, among other needs.

Launch Site Accessibility: Universal Design

- Accessible launches provide an opportunity for everyone to enjoy and share the experience on the water together. Most of the characteristics that a boater with a disability or an older adult with mobility restrictions desires are the same features that others look for in a launch:
    - A firm and stable surface directly into the water
    - A gradual slope that does not exceed 8.33%
    - Open area sufficient to turn around a 16 ft. or larger canoe or other craft

- The launch area is only part of an accessible site: also consider parking spaces, pathways, and restroom facilities so that they are accessible to all. Current accessibility requirements are available in the **Americans with Disabilities Act Standards for Accessible Design (ADASAD)** and in the **Architectural Barriers Act Accessibility Standards (ABAAS) for federal agencies.**

The ADA and ABA: What's the Difference?

Americans with Disabilities Act (ADA):

- **Who:** Private business owners, and State and local government both fall under the Americans with Disabilities Act.
- **What**: The ADA Standards for Accessible Design (ADASAD) provide guidelines to creating accessible facilities. The recreational boating section only deals with marinas, boat boarding docks and gangways. There are no requirements for launching areas for carry-in watercraft such as canoes, kayaks, and rafts.

Accessible John Gurney Park Boat Launch in Hart, MI

The ADA and ABA: What's the Difference, cont.

The Architectural Barriers Act (ABA):

- **Who:** Facilities designed, built, altered or leased by or for a federal agency, or with federal dollars or located on federal land.
- **What**: Projects that fall under the Act are required to follow the Architectural Barriers Act Accessibility Standards (ABAAS), which are more stringent than ADASAD. The recreational boating section addresses marinas, *boarding piers*, docks and *gangways*: there are no design requirements for launching carry-in watercraft.

ABAAS: a *boarding pier* must measure at least 60" wide through its length: a *gangway* may be less than 60" wide

Accessible Boat Launch Case Study: John Gurney Park Boat Launch

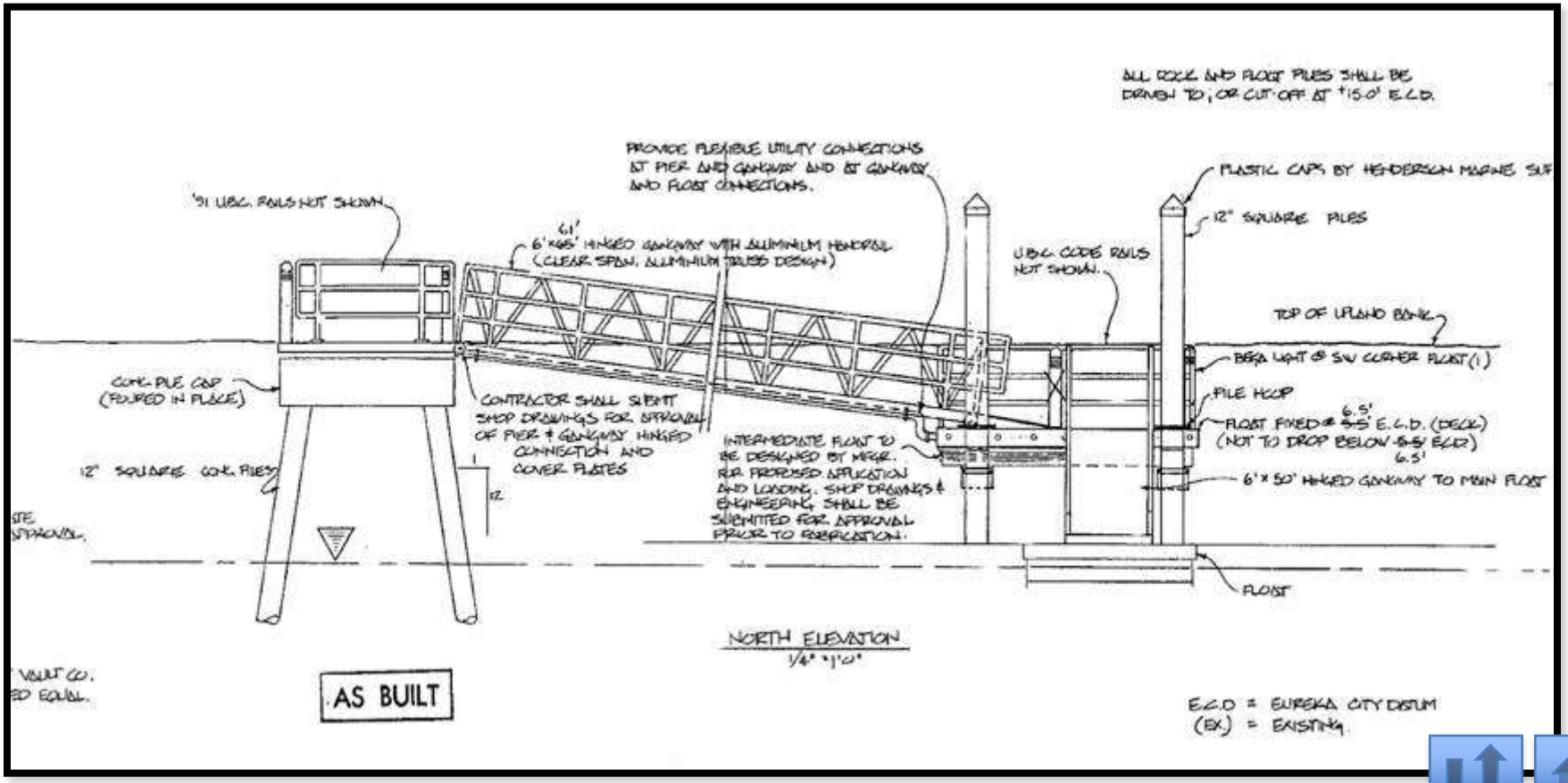
To improve the previously narrow and inaccessible ramp, the launch was widened from 12 to 18 feet, retaining walls were added, and the parking lot was raised and flattened. The new ramp has an 11% slope with an 8% slope concrete walkway between the parking lot and pier.

Accessible Launch Example: Bonnie Gool Guest Dock, Eureka, California

The Bonnie Gool Guest Dock maintains a consistently accessible slope of 8.33% for about 90% of the time. Only during extreme low tides does the slope become too steep. The launch is composed of several connecting parts. A fixed dock at the shoreline connects to an intermediate approach ramp at a 90 degree turn (*see below).* The ramp is surfaced with non-skid, aluminum alloy that provides traction and connects to a floating launch at a 90 degree turn.

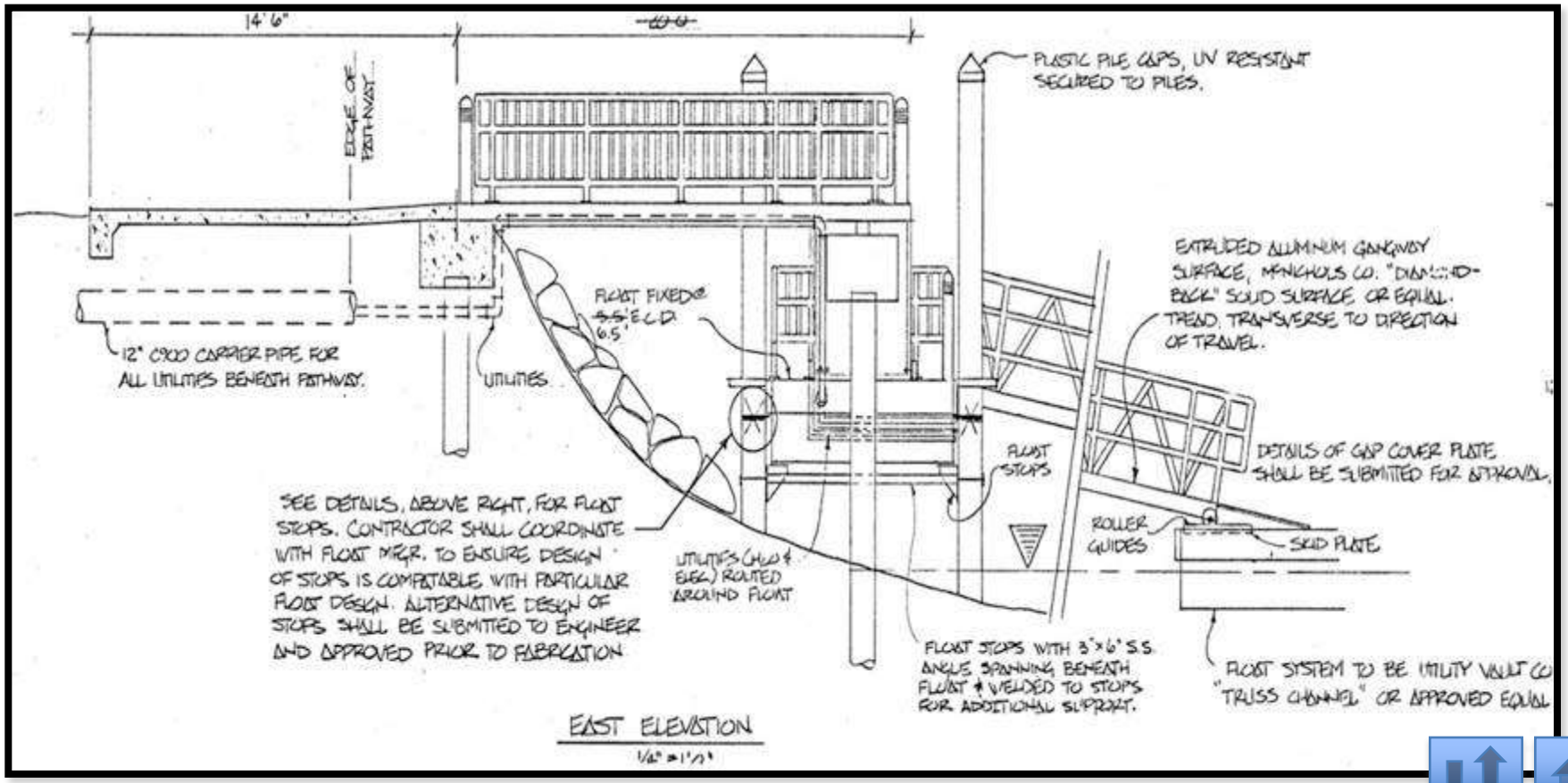
Accessible Launch Example: Bonnie Gool Guest Dock 1

Northern Profile



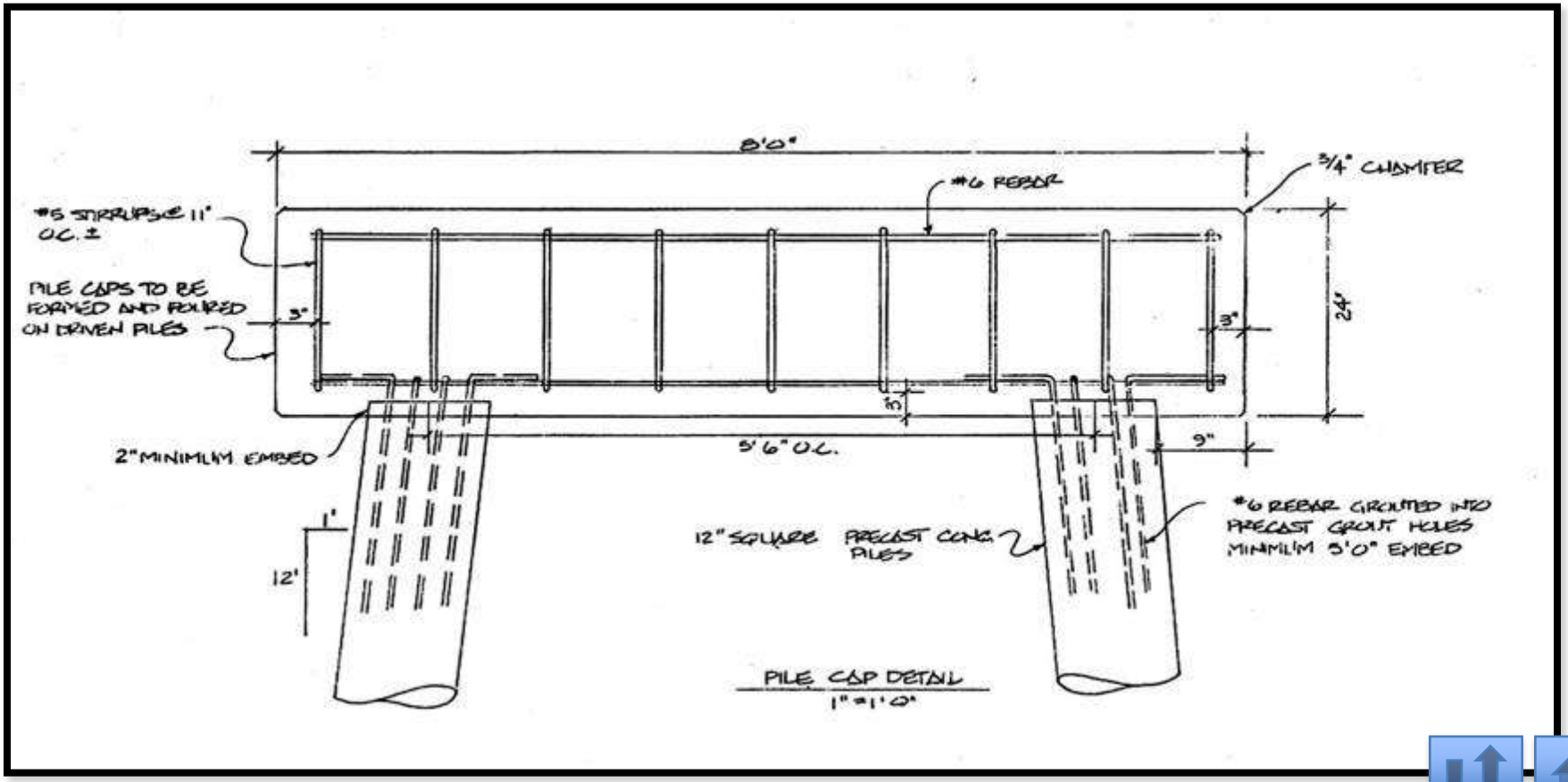
Accessible Launch Example: Bonnie Gool Guest Dock 2

Eastern Profile



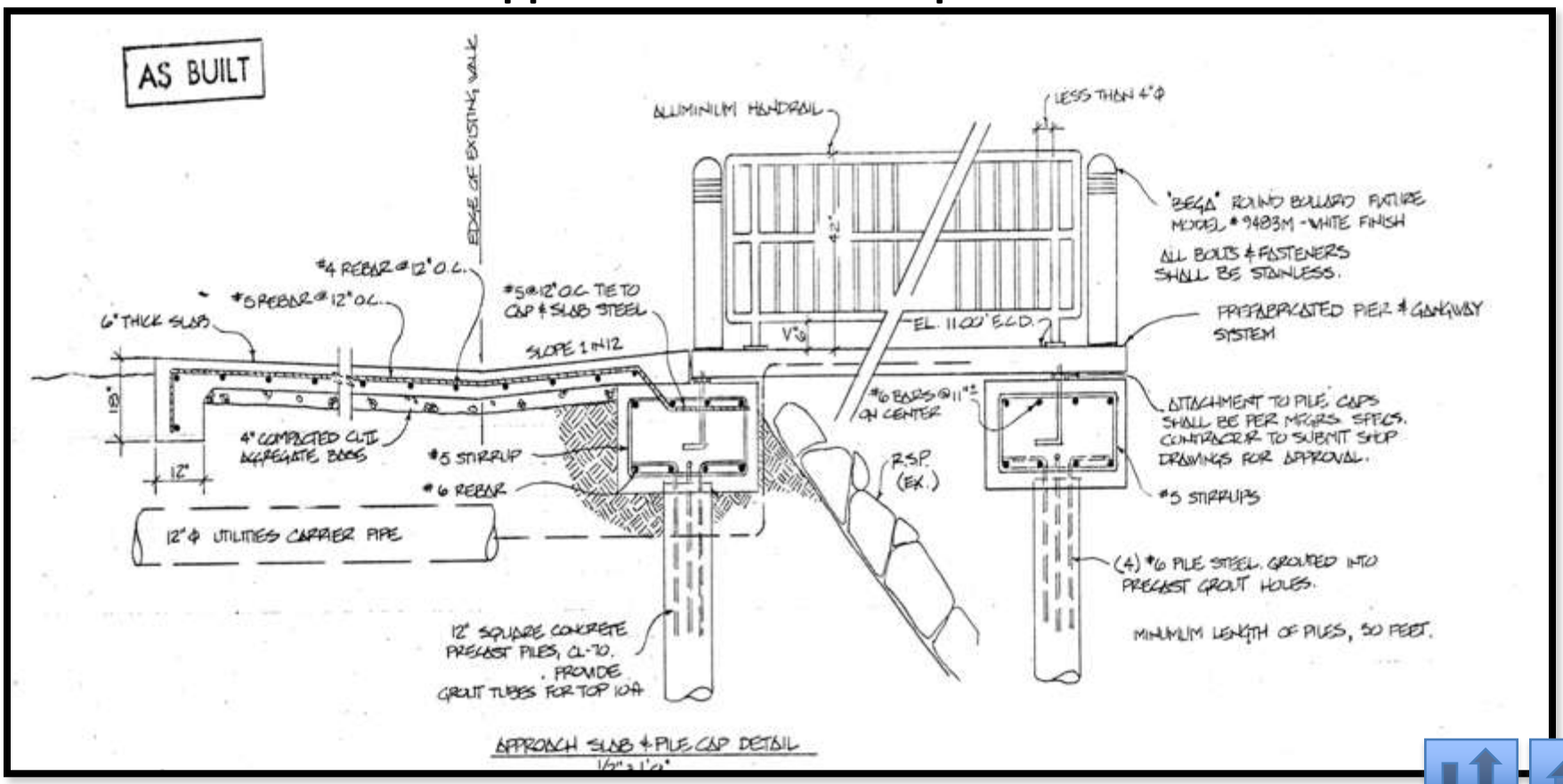
Accessible Launch Example: Bonnie Gool Guest Dock 3

Pile Cap Detail



Accessible Launch Example: Bonnie Gool Guest Dock 4

Approach Slab + Pile Cap Detail

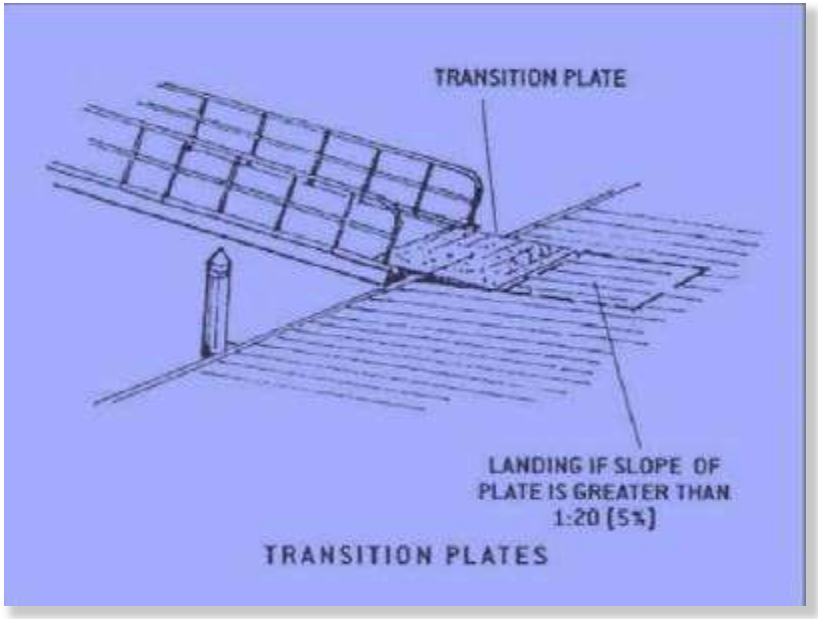


Accessible Launch Example:
Bonnie Gool Guest Dock - Photos

Suggestions for Creating an Accessible Launch

Transition plates: Sloped surfaces located at the end of a gangway. If the slope of a gangway is greater than 5%, it must include a landing at the non-gangway end of the transition plate and comply with accessibility standards for gangways.

Handrails: Handrails are not required on sloped surfaces that have a rise of less than 6“or a projection less than 72”, or a slope of 5% or less. Since the surface may be moving with changes in the water handrail, extensions do not need to be parallel to ground or floor surfaces.



Suggestions for Creating an Accessible Launch, cont.

Cross Slope: The cross slope of a structure refers to the slope perpendicular to the structure's "running" slope - a slope spanning the length of the structure. The cross slopes of gangways, transition plates, and floating piers that are part of an accessible route must be designed and constructed to not exceed a maximum slope of 2% (*see image below).* Once placed in the water, measurements absent live loads, are to be made from a static condition (i.e., absence of movement that results from wind, waves, etc.).

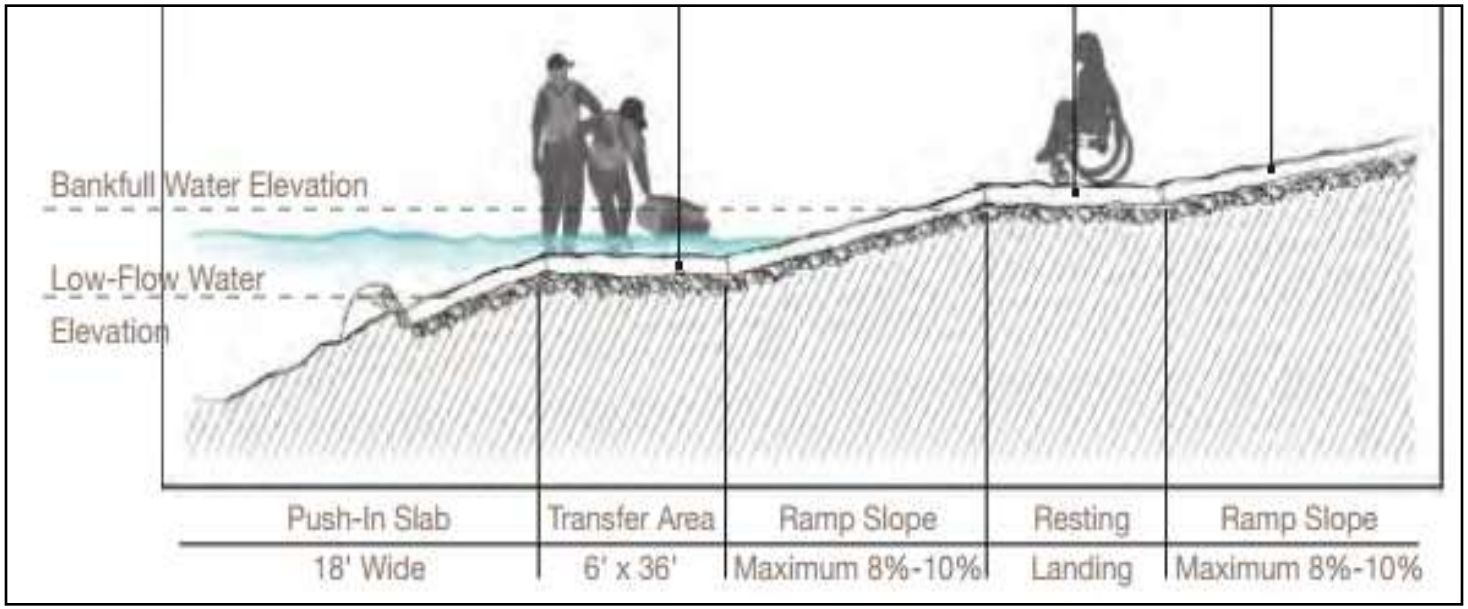


Diagram from Iowa DNR Water Trails Toolkit

Design that may be Useful for Paddlers with Disabilities:

When designing for paddlers with disabilities, know that a feature which is helpful to one person may block access for another.

Access Route: The surface, grade, width, and cross slope need to be as accessible as a location will allow. The surface should be as even and level as possible (not exceeding 8.33% slope or 2% cross slope) without gaps or interruptions. The route should be clearly marked.

Level and Stable Landing / Loading Area: There should be an area adjacent to the landing area that is level, stable, and at least 60” x 60”. This can be anywhere adjacent to the landing area.

Transfer Assistance: The greatest challenge to using a launch, once a paddler is beside the canoe, can be getting down into the seat of the boat. Whether it is on a highly developed launch or the bank of a lake, it is difficult to transfer to a moving boat. Therefore, provide flexible space adjacent to the boat for an individual to use.

Design that may be Useful for Paddlers with Disabilities:

Transfer Step: A moveable structure approximately 8” to 12” high that may be helpful to paddlers who have difficulty bending or squatting, and can provide wheelchair users with an intermediate step between their chair and the ground or boat.

Transfer Board: A board that slides out from the launch, over the top of the canoe, and allows a person to slide out over the canoe before sitting down on the seat. If located at gunwale level, it can both support a person’s weight and stabilize the boat as legs are moved around and adjustments are made.

Design that may be Useful for Paddlers with Disabilities:

Overhead Handles (Grab Bars): The transfer between land and boat can be extremely difficult to maneuver, especially when moving from a canoe seat to a higher launch platform. Alternative grab points can mitigate the complicated procedure of getting oneself onto a launch from a boat so that the boat is not the sole anchor point.

Surface Textures: Textured surfaces on a launch, included those added to provide extra traction, should be practical for wheelchair use. Surface gaps should not exceed 0.5” since the widths of most wheelchair and caster tires are 0.75” - 1”.

Step 3: Launch Development Considerations

Required permits and fundraising are crucial steps that will have a huge impact on the developmental stage of a launch design. In order to prevent last minute obstacles from cropping up in the course of a project, these topics should be researched and well understood before beginning design.

- Permitting
- Funding Resources
- Professional Resources

Launch Development Considerations: Permitting

Learn and understand early what permits might be needed for a site. Permitting may drive important aspects of the site plan. Understanding federal, state, and local permit requirements in the planning stages will avoid costly changes later in the development stage. The following agencies are a few that may require permits for the construction of a boating facility:

- U.S. Army Corps of Engineers
- Department of Transportation
- Environmental Protection Agencies (federal, state, local)
- Local building, zoning agencies, or boards

Launch Development Considerations: Federal and State Funding Resources

Depending on your project, there may be organizations available to help with funding. Listed below are a few of the more well known funding sources, but project funding may be available for launch development, land acquisition, site development, and environmental mitigation.

The Land and Water Conservation Fund

The LWCF Program provides matching grants to States and local governments for the acquisition and development of public outdoor recreation areas and facilities (as well as funding for shared federal land acquisition and conservation strategies). The program is intended to create and maintain a nationwide legacy of high quality recreation areas and facilities and to stimulate non-federal investments in the protection and maintenance of recreation resources across the United States

http://www.nps.gov/ncrc/programs/lwcf/grants.html

The Recreational Trails Program (RTP)

RTP provides funds to develop and maintain recreational trails and trail-related facilities for both non-motorized and motorized recreational trail uses. The RTP is an assistance program of the Department of Transportation's Federal Highway Administration (FHWA). Each State administers its own program. Contact your State RTP Administrator for guidance on State policies and project eligibility requirements. Many States fund water trails and/or access to water trails, but not all.
http://www.fhwa.dot.gov/environment/recreational_trails/

States Organization for Boating Access

State Boating Access, Clean Vessel Act (CVA) and Boating Infrastructure Grants (BIG) projects - States administer grants for public recreational boat access to waterways. The States Organization for Boating Access maintains state contacts for these grants.

http://www.sobaus.org/resources/resources.html

Launch Development Considerations: Foundation Funding Resources

In addition to federal and state funding sources, many foundations support projects that allow more people to get access to the outdoors.

The Foundation Center

A directory of private funding sources. They provide information on philanthropy, fundraising, and grant programs.

www.fdncenter.org

The American Canoe Association

Provides grants for the construction of waterway access called the Club Fostered Stewardship Grant. See link below for more information.

http://www.americancanoe.org/?page=LLBean_CFS_Grant

Outdoor Nation

Provides small grants, including Paddle Nation Project Grants, which support pioneering projects and initiatives that are youth-developed that result in increased paddling participation. They also have Take Me Fishing Awards which support pioneering projects and initiatives that are youth-developed and result in increased fishing participation. http://outdoornation.org/outdoor-and-environmental-grants

Launch Development Considerations: Professional Resources

Help can come in the form of technical support, too:

The National Park Service Rivers, Trails and Conservation Assistance Program (RTCA)

RTCA provides technical assistance to agencies, communities and organizations to help them with their recreation and conservation goals. RTCA has helped many water trails groups seeking to provide more access to local water bodies.
www.nps.gov/rtca

The River Management Society (RMS)

RMS is a national non-profit professional organization whose mission is to support professionals who study, protect, and manage North America's rivers. Queries sent to RMS can be forwarded to their members who often can provide help.

www.river-management.org

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- Rivers, Trails, and Conservation Assistance Program (RTCA)
- River Management Society (RMS)

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- Slide 82: Jeff Rainey, Harbor and Facilities Superintendent, City of Eureka, CA
- Slide 83: Jeff Rainey, Harbor and Facilities Superintendent, City of Eureka, CA
- Slide 88: Jeff Rainey, Harbor and Facilities Superintendent, City of Eureka, CA
- Slide 89: http://www.dnr.sc.gov/marine/NERR/present/accessibility/RecreationalBoatingFacilitiesFishingPiersPlatforms.pdf
- Slide 92: top image - http://www.kay-akcess.com/kayak-dock-launch-news.html
- Slide 92: bottom image - http://www.knightboatdocks.com/products/docks/EZ-launch/
- Slide 93: top image – http://ezdockkentucky.com/contentpage2.cfm?page=kayak-docking-station
- Slide 93: bottom image - http://ezdockusa.com/products/ez-dock-products/ez-launch-kayak-and-canoe/

3 | LAUNCH DESIGNS

- Natural Surfaces
- Geotextile Mats
- Concrete Mats
- Concrete Ramps
- Wooden Stairs
- Concrete Stairs
- Docks / Piers
- Cantilevers
- Floating
- Elevated Walkways
- Portages

Many launch types are available to meet the needs of various environments. This section can help you choose the appropriate design and construction method for your site.

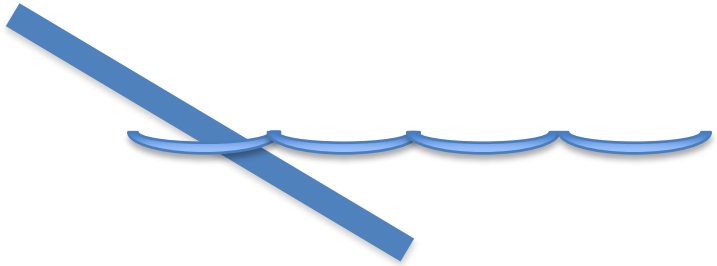
List of Figures, Tables and Case Studies

List of Figures, Tables, and Case Studies

Launch Design Categories

Ramps

Perfect for gradually sloped banks. Various materials are used depending on the desired or necessary characteristics of your site.

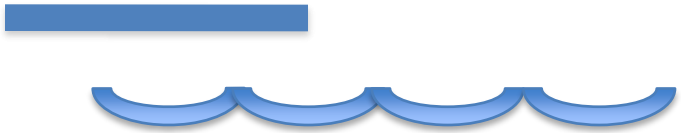


Stairs

On sites where the banks are too steep to access by a ramp, stairs are an appropriate launch option.

Elevated

Elevated launches can be used to bypass environmentally sensitive areas or areas of unstable ground. They are an appropriate choice for bulk-head banks as well.

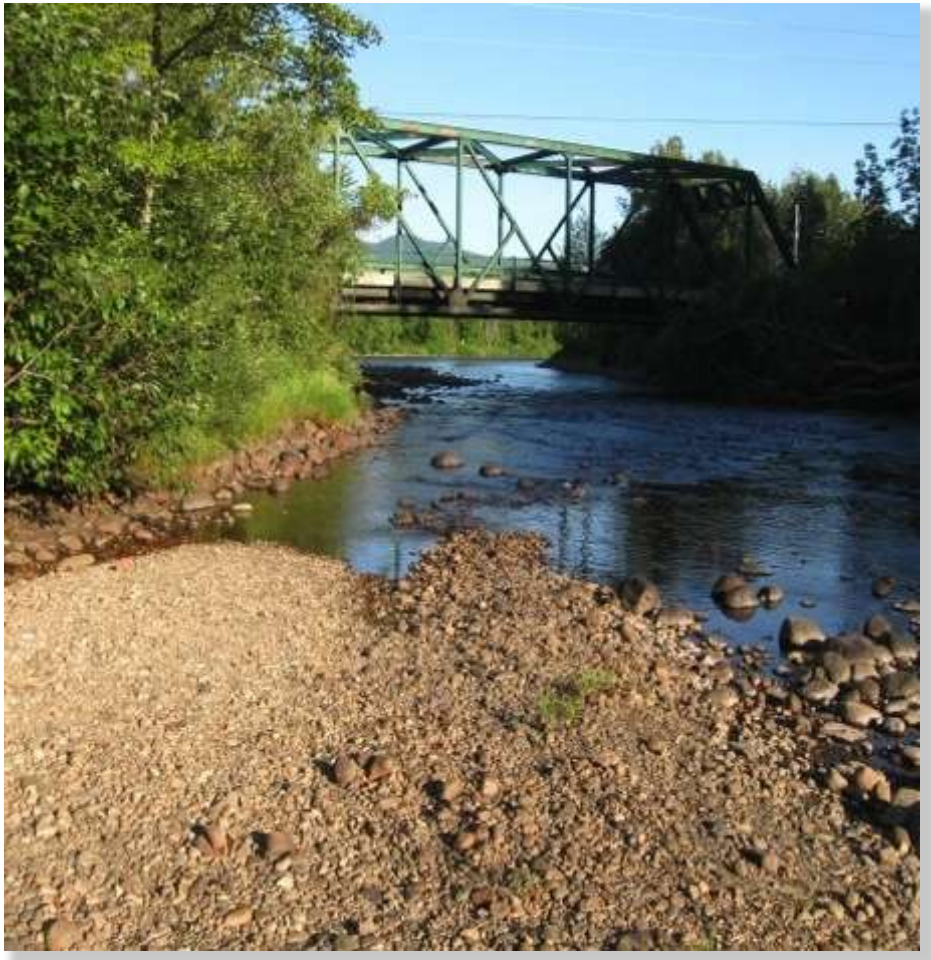


Minimal Construction Design

Natural Surfaces

Incorporates the natural characteristics of a site to create a stable, safe surface for launching.

Natural Surfaces



The simplest and most cost-effective launches require little or no construction. Paddlers may use natural features (e.g., riverbanks, rock outcrops, banks adjacent to bridges) or existing shorelines with decks, bulkheads or boardwalks. Any of these can suffice as long as currents in the area are relatively modest, water depth allows for stable launching without damage to boats, and the bank or shore is close (vertically, above) to the surface of the water. Paddlers must also have enough space to place their boats in the water and easily step in or out of them.

Materials

Variations and Specifications

Advantages / Disadvantages

Photo Examples

Natural Surfaces: Materials 1

- Native soil, sand, gravel, or vegetation may be added to improve drainage and control erosion; fist-sized rip-rap can be added to trap sediment and fill in over time. *See photo to right.*
- Natural materials unique to a particular area may blend with the natural landscape and be most easily accessible (e.g., in the Chesapeake Bay region native crushed oyster shells are used to reinforce surface landings)
- Flat rocks can provide excellent firm surfaces. Avoid pointed or jagged rocks: they create unstable surfaces that can damage watercraft or injure paddlers.

Natural Surfaces: Materials 2

- Matting can be used to temporarily stabilize a sandy beach with a firm substrate.
- Gravel can be used to form simple ramps, preferably in areas with minimal wave action or water level fluctuation, as seen in the picture below.
- Braided rope, tied to a tree or other shoreline anchor, can serve as a makeshift handrail.
- Existing shoreline configurations (e.g., bulkheads, boardwalks, uneven rocks) can be converted into beach areas by adding firm sand substrates and/or gravel; these are called “implanted” beaches.

Natural Surfaces: Design Variations and Specifications

- Graded banks should be 12’ wide at water line tapered to 9’ wide at top and 15’ long (length will depend on water levels and shoreline stability).
- Launch area should be at least 20’ at sites that are used for both rafting and paddling.

Smith River, Montana kayak and raft launch

Natural Surfaces: Design Variations and Specifications

- Preferred slope is 8%.
- The water level should be deep enough to enable launching without damaging a boat- at least 2 feet; kayakers may want at least 4 feet in depth to allow them to practice rolling.

Natural surface design on the James River in Virginia

Natural Surfaces: Advantages

- Cost-effective/low maintenance
- Native materials can be easily added or shifted to suit needs and changing conditions
- Low environmental impact due to the lack or low level of construction
- Can be combined with simple construction to restore habitat or control erosion
- Aesthetically pleasing, given the minimal visual alteration to natural shoreline
- Shoreline and beaches can provide easy anchorage

Natural Surfaces: Disadvantages

- May not be consistently accessible due to varying flows, water levels, exposure, or other climatic factors
- Can be slippery or difficult to manage when wet
- Can be steep
- Could cause damage to wetland habitats, depending on frequency of use
- Not easily spotted from rivers – paddlers may pass them by if there is no signage or clear indication of the access site
- Gravel ramps can erode easily and can scratch boats if paddlers do not land properly
- Chemicals from railroad ties or treated wood may pollute water where leaching occurs

Natural Surfaces: Photo 1
Clear Creek, Golden, Colorado

Natural Surfaces: Photo 2
Arkansas River, Salida, Colorado

Mat Launch Designs

Geotextile Mats

Geotextile mats/blocks are lightweight mats composed of open cells that allow water to pass through. If implemented correctly, they are effective at stabilizing banks.

Concrete Mats

A concrete mats create a permeable surface that is flexible to the characteristics of your landscape. They are often used in bank stabilization projects.

Geotextile Mats

Geotextile mats or blocks are lightweight, plastic mats composed of open cells that allow water to pass through to vegetation below. Since they enable access in environmentally sensitive areas without significantly disrupting riparian habitats or vegetation, they are often used near lakes or reservoirs or to access water from marshy areas.

To further understand Geotextile mats check out this link:

Construction Site Best Management Practices Manual

Materials

Variations and Specifications

Advantages / Disadvantages

Case Study

Geotextile Mats: Materials

Commercial products offer a flexible material that can support heavy weight while protecting vegetation. Interlocking mats are stabilized by topsoil or vegetative material spread into the cells. Grass can be also used at sites that see low to moderate use. Fist-sized gravel can provide a smooth surface for walking and also serve as reliable anchors.

The following vendors carry geotextile products and supplies. This is not an exhaustive list and is meant only as a sampling. It is not an endorsement of these companies or their products.

- Terram
- Propex ™ Geotextile Systems
- US Construction Fabrics
- Presto Geosystems®
- Boddingtons
- US Fabrics
- Carthage Mills
- Nilex

Geotextile Mats: Variations and Specifications

- Proper anchoring of mats and blocks is essential, as erosion can cause them to separate and scatter in the water, potentially becoming dangerous strainers in the water downstream.
- In areas that become submerged, gravel can be added into cells in order to add weight and anchor them in place.

Articulating concrete block installation with geotextile fabric

Same site with fully vegetated concrete block/geotextile installation completed

Geotextile Mats: Advantages and Disadvantages

Advantages

- Lightweight
- Made of recycled polyethylene
- Allow light to penetrate (40% open area per panel)
- Will not leach chemicals into water or surrounding riparian area
- Will not rot
- Have tread width of 20”

Disadvantages

- Can be more expensive than other materials
- Require the use of special tools
- May take longer to install than other materials
- Can create potentially dangerous strainers, down river or elsewhere on a water body, if erosion causes blocks to separate and scatter in the water.

Geotextile Mats Case Study: Deal Island Wildlife Management Area, St. Peters Creek, Maryland

Constructed as part of a traditional boat launch for motorized boats, this “soft” launch was built using Geoweb cellular confinement material filled with pea gravel. The launch serves a dual purpose of providing separate access to paddlers and stabilizing the shoreline from erosion.

Geotextile Mats Case Study: Deal Island Wildlife Management Area Specifications

Dimensions:

Geocell is 8’ wide x 16’ long x 6” thick

Anchor:

Geocell is filled with #67 pea gravel, naturally rounded with no sharp edges; placed on a 4” thick compacted layer of CR-6

Slope:

1:8, from an elevation of +1.5’ down to an elevation of -0.5’

Geotextile Mats Case Study: Deal Island Wildlife Management Area Photos 1

Geotextile Mats Case Study: Deal Island Wildlife Management Area Photos 2

Concrete Mats

Concrete mats follow the changing slope of a bank and do not require cutting or filling. Installation usually requires heavy equipment, such as an excavator with a spreader bar, or a crane.

- Materials
- Variations and Specifications
- Advantages / Disadvantages
- Case Study

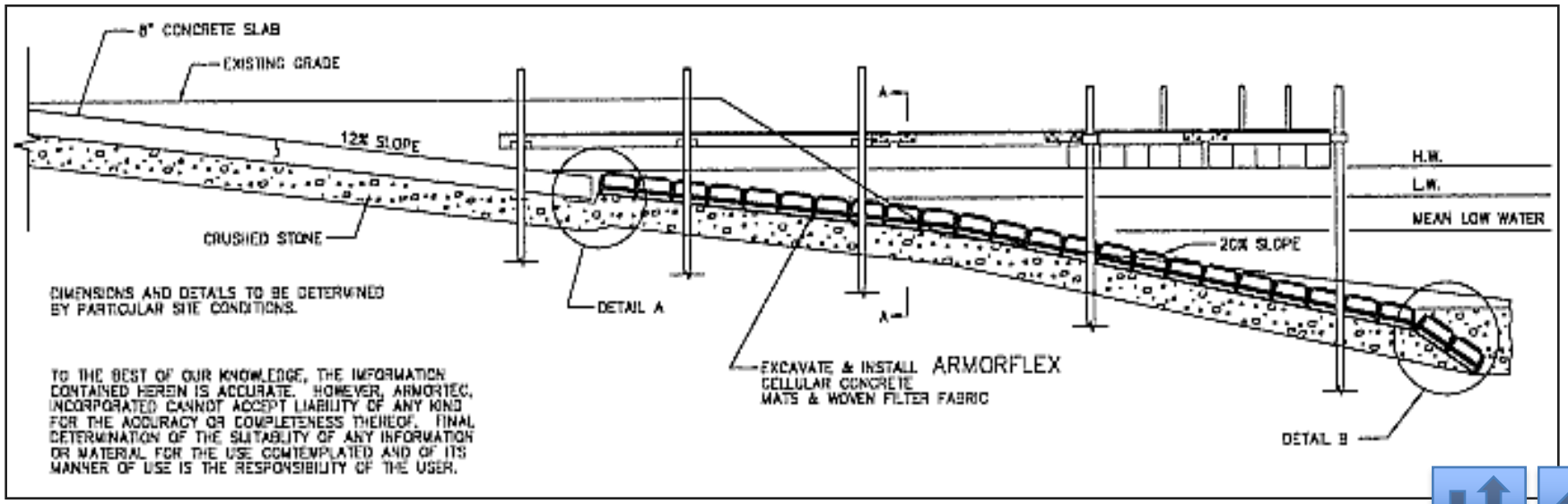
Concrete Mats: Materials

The following vendors carry concrete mat products and supplies. This is not an exhaustive list and is meant only as a sampling. It is also not an endorsement of these companies or their products.

- Waskey
- R. H. Moore
- Shoretec®
- International Erosion Control Systems
- Nilex
- Robusta
- Permatile
- California Flexamat

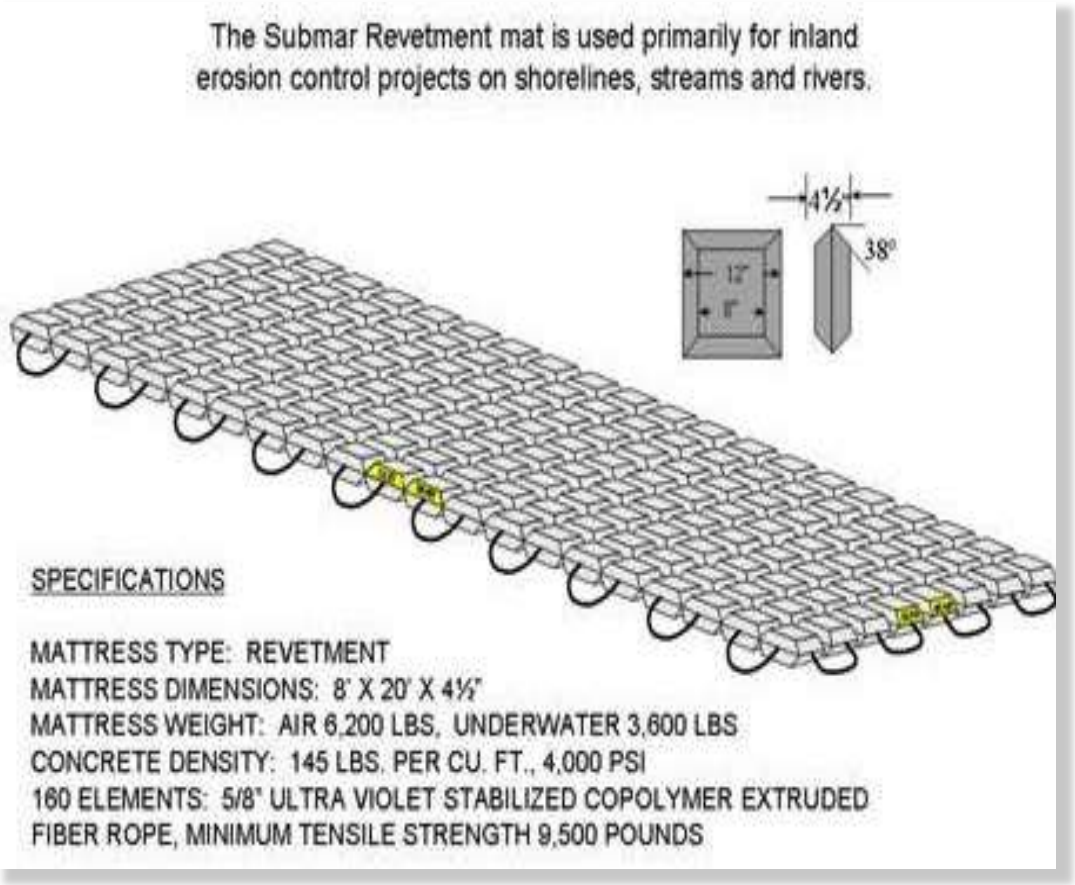
Concrete Mats: Variations and Specifications

- Articulated mats follow the changing slope of a bank. They are supplied as mats, typically delivered via flatbed trailer, that interlock as they are being placed. Their installation usually requires heavy equipment, such as an excavator with a spreader bar, or a crane.
- Placing concrete mats may require some underwater preparation, as the ends of the mats are often submerged in the water, depending on the slope. Submerged areas may need to be sub-excavated and filled with a leveling course, such as washed gravel. If the bank soil is soft, it may require extra protection; an engineering fabric can be added or sub-excavation can be increased, along with the gravel leveling.



Concrete Mats: Variations and Specifications, cont.

Bank surfaces may need smoothing, so rod readings may be used, with the water serving as a leveling device. The first mat (usually the center one) should be placed carefully, as it is needed to align the others. Once the remaining mats are set, they interlock with each other. When all mats are in place, the loops on the upper end of the mats are pulled, using an excavator, to tighten the mats together. Loops are clamped off and buried. Pea gravel may be spread over the mats to fill spaces between the blocks, stabilizing them.



Concrete Mats: Advantages

Advantages

- Since they are pre-cast, concrete mats will not require coffer damming to install
- Concrete mats may be applied to a shoreline without significant alteration to its slope. Cutting or filling the bank is not necessary, as it might be with a concrete ramp that needs to be poured at a steady grade.
- Since there is less risk of deposition from the cut or erosion of the fill, there is less need for regular maintenance.
- Concrete mats typically have soil or gravel between the blocks and are therefore less developed or intrusive to a natural shoreline than poured concrete.
- If erosion becomes a problem, concrete mats can adapt to changing bank structures; if supporting soil is washed away, blocks may slide downward and provide protection to eroded areas.
- Suitable where access is shared with motorized boats.
- Given the gentle approach, concrete mats can be accessible to all users.

Concrete Mats: Disadvantages

Disadvantages

- Typically are more expensive than concrete slabs
- Are heavy (an 8’ X 26’ mat weighs approximately 5 tons) and require heavy duty equipment to install
- Installation can damage shorelines vegetation, when heavy equipment is used
- May not be considered aesthetically pleasing to some (disruptive to the natural look of shoreline)
- Excessive for non-motorized use launch sites.

Concrete Mats Case Study: York Bridge, Missouri River, Montana

Problem: York Bridge was initially a motor boat launch site that was also popular for canoeists, mainly due to its location above a backwater. Due mainly to heavy boater usage, there were a number of erosion problems along the shoreline.

Solution: Slopes on the downstream side of the detention basin were smoothed and reinforced with an articulated concrete mat, and an existing ditch was filled in order to widen the launching area. Articulated concrete was chosen as an alternative to rip-rap, to mitigate the effects of erosion while providing an alternative access to canoeists. This enables canoeists to launch without competing with motorized boaters for space. Additionally, an access to canoeists and small boaters, it also makes the detention basin easily accessible for maintenance purposes.

Concrete Mats Case Study: York Bridge, Missouri River, Montana

A gravel road provides access to both the launching area and a detention basin used for maintenance purposes.

Concrete Mats Case Study: York Bridge, Missouri River, Montana

An articulated concrete launch helps to protect against the effects of erosion while providing paddlers with a separate access site from heavy boat traffic.

Ramp Launch Designs

Concrete Ramps

Concrete ramps provide an extremely stable surface for launching. They are very adaptable to various landscapes.

Concrete Ramps

- Concrete ramps may be used as launches by themselves or in combination with floating launches, piers, bridges, dock abutments, bulkheads, and rock cribs. If the ramp connects to a floating launch using a bridge, a hinged metal transfer plate will allow an easier transition.

- Concrete must be installed in dry conditions. The area must be totally clear of water when any portion of the ramp extends beneath the surface of the water. The underwater area may need to be dried out with a cofferdam, a watertight enclosure that is temporarily used to pump water out of an area during construction. If lime is used in this process, it must be managed carefully so it does not to enter the water where it can pose a danger to riparian species.

- Pre-cast concrete planks and panels should only be used in bodies of water with little to no current. Pre-cast slabs are heavy and must be placed using lifting equipment. Reinforced concrete is often used for underwater sections of the pre-cast ramp.

Materials
Variations and Specifications
Advantages / Disadvantages
Photo Examples

Concrete Ramps: Materials

Surface finish, including corrugated concrete, rock salt, or exposed aggregate may be applied to concrete to increase traction or improve its appearance. One popular finish uses 1” by 1” V-grooves formed at a 60-degree angle to the centerline. V-grooves should not be used on launches that serve wheelchair use as they are difficult to travel over/on when driving a wheelchair.

Concrete Ramps: Variations and Specifications

- The width and thickness of concrete ramps vary, but cast-in-place ramps are typically 6” to 8” thick and use rebar reinforcement.
- Ramps can be cast-in-place or composed of connected pre-cast slabs, planks, or panels.
- Can cover concrete with a layer of synthetic matting or even ‘AstroTurf’ to protect sensitive boats. (See picture on right, from Great Calusa Blueway, Florida.)

Concrete Ramps: Variations and Specifications, cont.

Important elements are using a downstream-pointing departure angle of 30 to 45 degrees, and hard-surfacing for anything below the frequent flood elevation (where permanent vegetation ceases). This allows skid steers to find a bottom in high-sediment areas, and helps projects in high-scour areas withstand the force of the water. It also creates an eddy just downstream of the launch at all flows, which makes it easier for the user. An example of what this may look like is *shown to the right*.

Concrete Ramps: Advantages

- Provides the most stable, sturdy surface for launching
- Durable and not subject to rot or rust
- Easy to shape and work with, adaptable to slope needs; minimal additional construction needed
- Can be relatively inexpensive to construct
- Relatively low maintenance (depending on sedimentation levels); easy and inexpensive to repair
- Used to help mitigate erosion or assist with vegetative restoration
- Their noticeable presence can assist paddlers with locating take-outs from the river
- Can be surfaced aesthetically with materials such as river rocks, fieldstones, or salt finishing

Concrete Ramps: Disadvantages

- Can cause damage to riparian ecology, preventing growth of vegetation and impacting habitats
- Surface can be slippery, especially when muddy or wet (corrugated concrete, rock salt, or exposed aggregate on the surface can provide effective traction)
- Coffer damming may be required for installation (will increase the cost and complexity of project)
- Can be damaged or crack easily due to freezing and thawing conditions
- Usually not aesthetically "pleasing,"
- Construction vehicles, if needed during installation, will have a heavy impact on your site
- Potential lime deposit down river during construction

Concrete Ramps Photo 1:
Salida Boat Ramp, Arkansas River- Salida, Colorado

Concrete Ramps Photo 2:
Salida Boat Ramp, Arkansas River - Salida, Colorado

Salida's concrete boat ramp is an example of a launch site that has helped contribute to the revitalization of a town. Before this launch was installed a few years ago, this corridor of the Arkansas River was both inaccessible and unfriendly to paddlers and the general public. The area had been severely neglected and had become a depository of debris and waste from industrial sites upstream.

Part of the Arkansas River Trust's Whitewater Park and Greenway Project, installation of this boat ramp has helped to transform this spot into a popular site for launching, fishing, and other river-based activities. Native vegetation has replaced hundreds of tons of concrete along the banks and a whitewater course was installed, which plays host to an annual white water festival, FIBArk.

Photo courtesy of Trevor Clark at the 2008 FIBArk festival.

Stair Launch Designs

Wooden Stairs

- Large stones or timber used to build natural stairs can create excellent access along steep banks.
- Staircases composed of timber steps may be cost effective alternatives to concrete when working with a launch site along a steep shoreline.

Concrete Stairs

- Concrete stairs are particularly effective in providing access along steep shorelines. They are durable and easily maintained.

Wooden Stairs

Staircases composed of timber steps may be cost effective alternatives to concrete when working with a launch site along a steep shoreline. Timber can be easily cut and shaped to meet site specifications and may be built into a steep shoreline in a variety of manners, depending on a site's needs.

For example, timber cut into rectangular or cylindrical piece could be installed from the bottom of a slope upwards, stacked one upon another, in order to reinforce an eroding slope.

Materials
Variations and Specifications
Advantages / Disadvantages
Case Study / Photos

Wooden Stairs: Materials

- Timber, typically pressure-treated (review environmental issues of chemically-treated wood)
- Reinforcement bars, rebar
- Soil, gravel, or “road base” (mixture of rough soil and class 6 gravel), used as fill
- Retaining walls, rip-rap (as needed)

Pressure treated timber

Rebar

Wooden Stairs: Materials

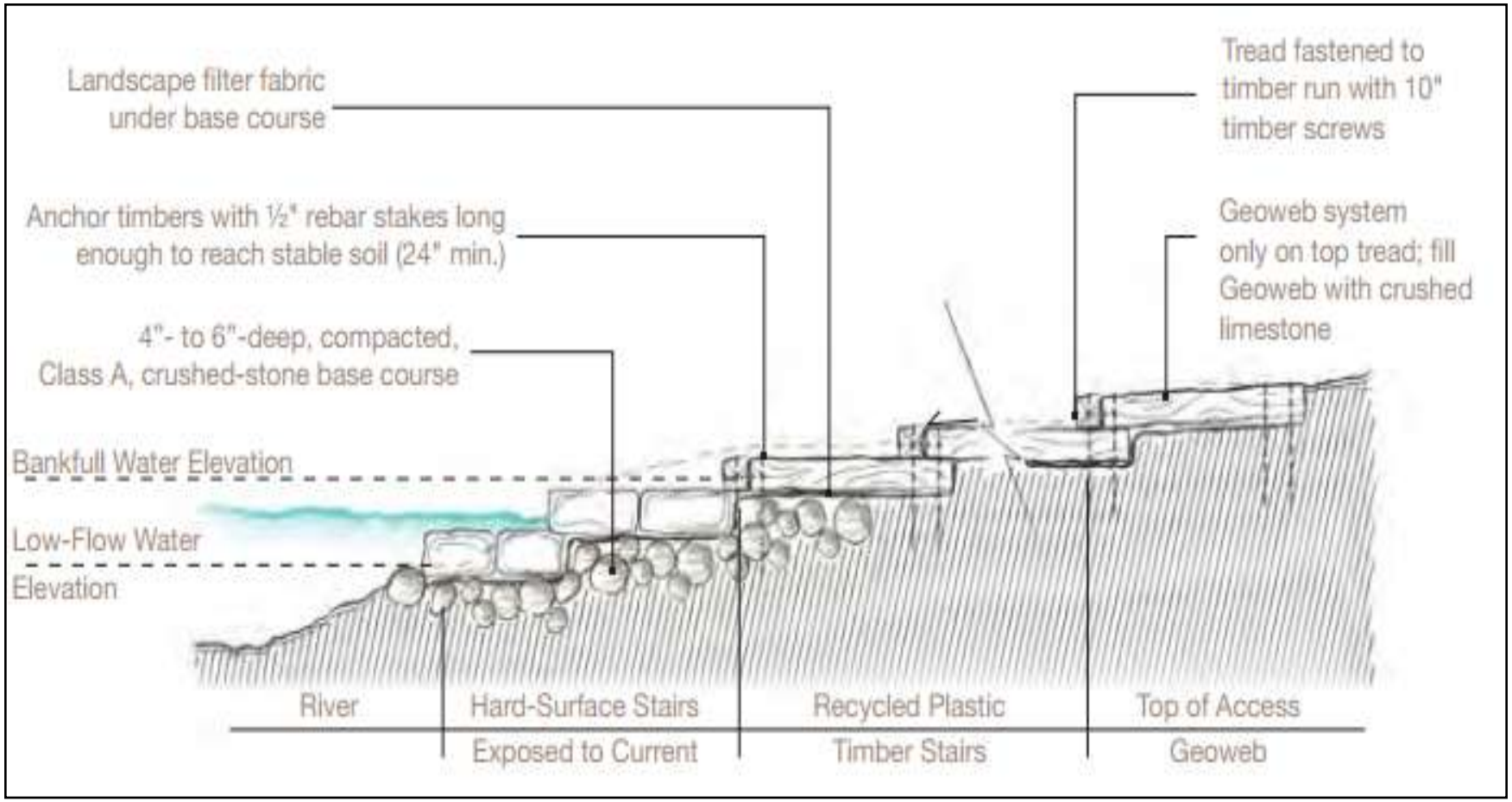


Diagram from [Iowa DNR Water Trails Toolkit]

Wooden Stairs:
Design Variations and Specifications

- Stairs may be constructed as boxes built on top of one another, ascending a slope, to help reinforce an eroding bank.
- The launch area at the base of the stairs needs protection from excessive currents in order to prevent undercutting; large rocks or a vegetative buffer may be used.
- Launch area at base of stairs should provide consistent access to the water, during changing water levels; surface should be sturdy and able to withstand varying flows.
- Handrails are most effective when they are 24” to 32” above the height of the steps; it is important that they not be too high or low for paddlers to be able to use.

Wooden Stairs:
Design Variations and Specifications

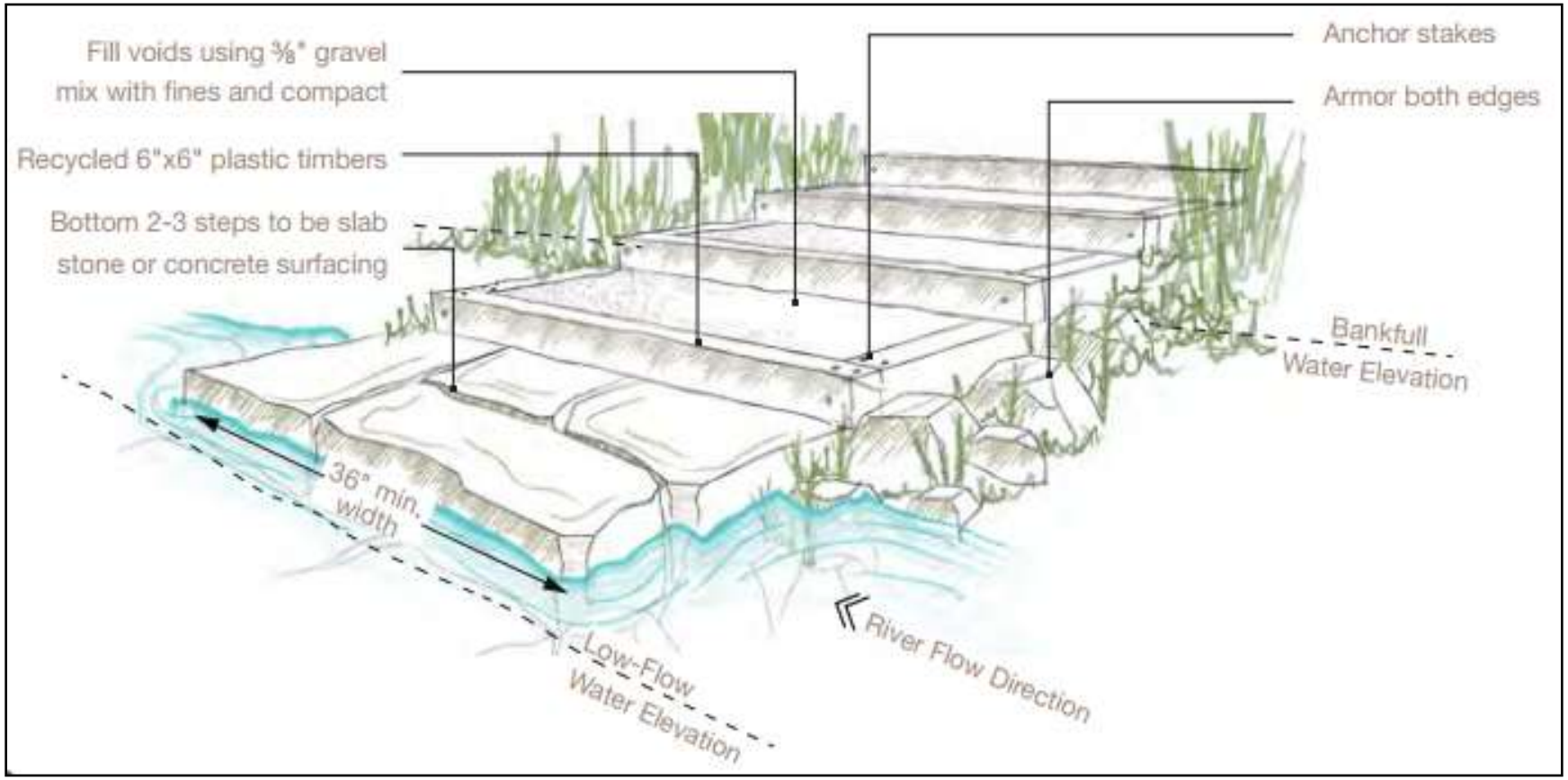


Diagram from [Iowa DNR Water Trails Toolkit]

Wooden Stairs: Advantages and Disadvantages

Advantages

- Allows paddlers easier access from a steep or eroding shoreline
- Aesthetically pleasing and less disruptive to natural shoreline than concrete
- May be easily and inexpensively repaired, if damaged

Disadvantages

- Is not accessible to all
- Installation may be costly and may require alteration to shoreline
- May be susceptible to undercutting
- May require maintenance as stairs age and weather

Wooden Stairs: Case Studies

Jump Rock Launch Site, Arkansas River, Salida, Colorado

White Rock Park, Colorado River, La Grange, Texas

Fisherman's Bridge, Arkansas River, Salida, Colorado

Wooden Stairs Case Study: Jump Rock Launch Site

Jump Rock, a site along the Arkansas River, has a stairway constructed of 8” x 8” x 8’ treated timber. On the steeper part of the hill, the timbers are placed close together with the tread and rise at 8” in some areas. As the hill becomes less steep, the tread increases but the rise remains at 8” in order to reduce erosion and need for maintenance. At the top of the hill, where it is least steep, the tread and rise decreases to the point where the top few stairs are relatively shallow.

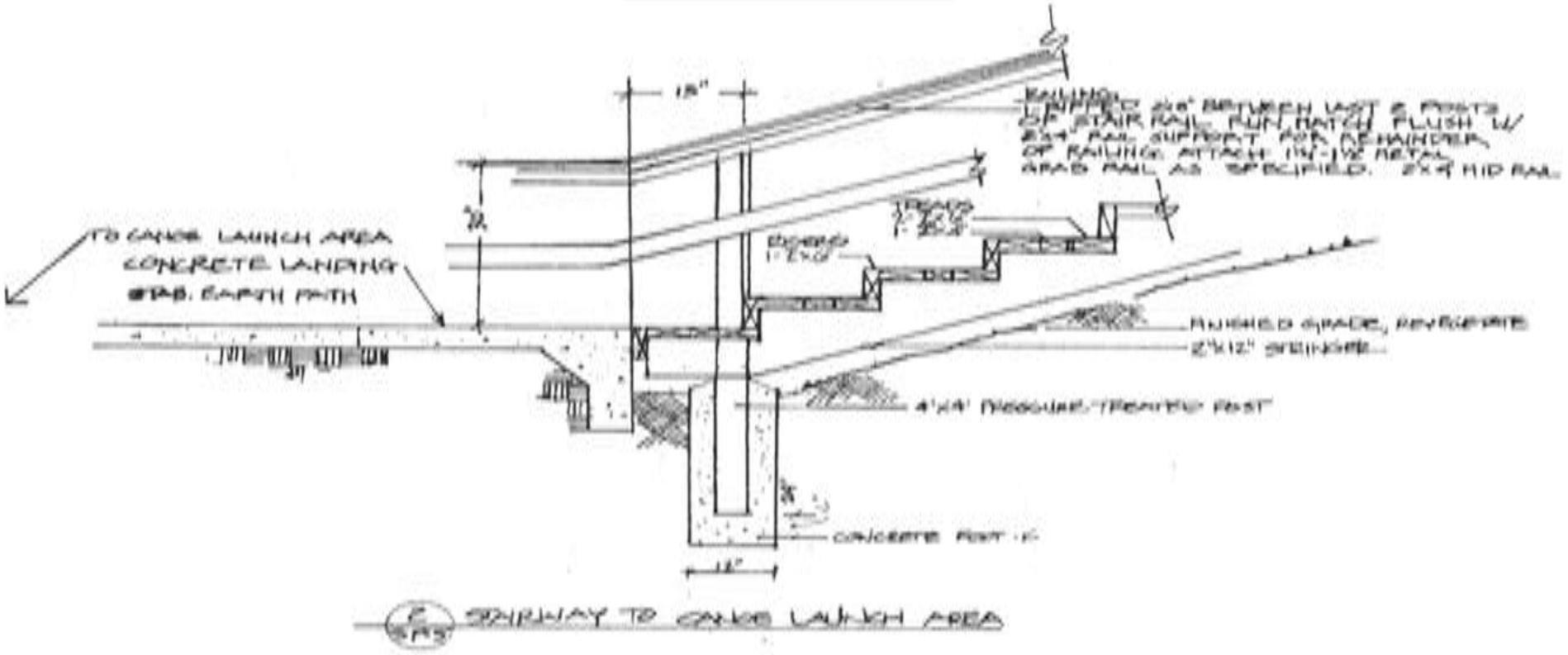
Wooden Stairs Case Study: Concept Drawings for White Rock Park Colorado River, La Grange, Texas

The following staircase, leading to a canoe launch below a 40 ft. cutback along the Colorado River was never constructed. However, the following designs for the staircase offer an effective solution to providing access along an extremely steep bank.

Colorado River in La Grange, TX

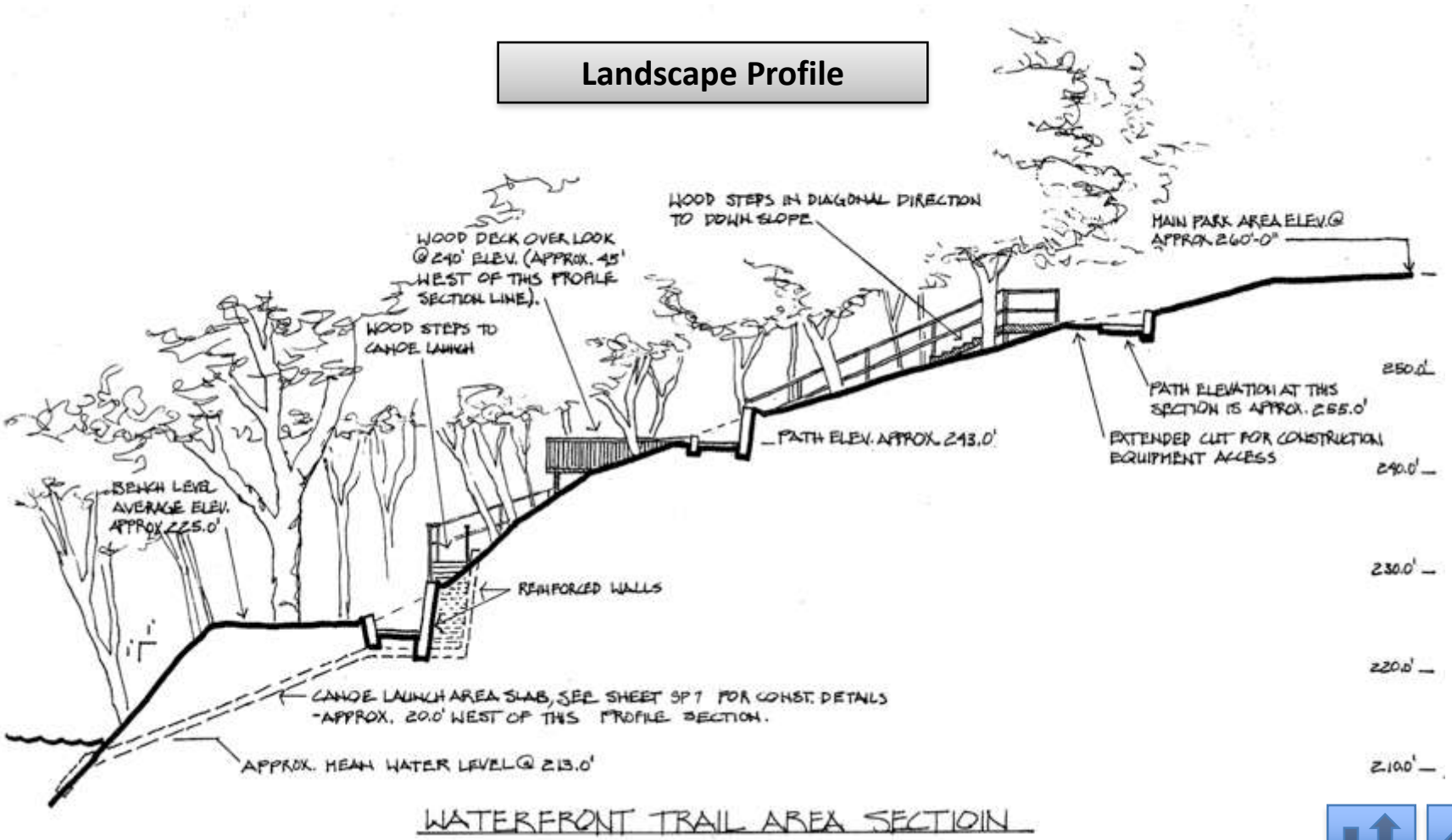
Wooden Stairs Case Study: White Rock Park

Detailed Profile



Wooden Stairs Case Study: White Rock Park

Landscape Profile



Wooden Stairs Case Study: Fisherman's Bridge

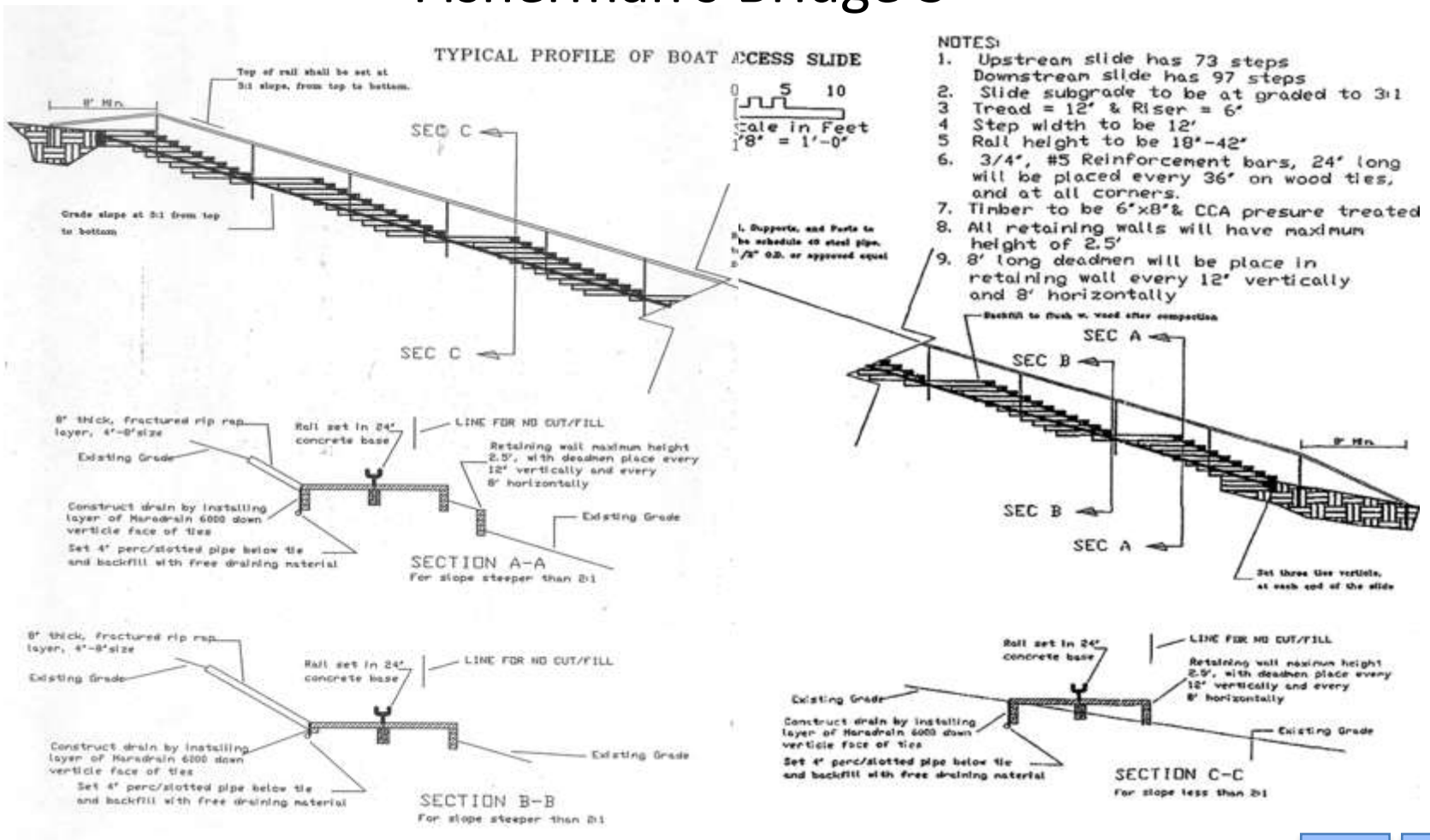
Problem: The slope at this popular raft and kayak launch site is very steep and vulnerable to erosion. In order to access the river, paddlers had to slide down the bank, which increased the erosion problem.

Solution: A 15 foot-wide timber staircase, with a metal slide for rafts and boats, was installed into the slope. Parallel metal bars running down the center of the staircase allow paddlers and rafters to slide boats and rafts to the water below

Construction of the staircase was designed to maximize bank stabilization. Each stair level consists of a timber box filled with "road base," a mixture of rough soil and class six gravel. Boulders placed at the base of the staircase provide protection from undercutting.

Wooden Stairs Case Study: Fisherman's Bridge 2

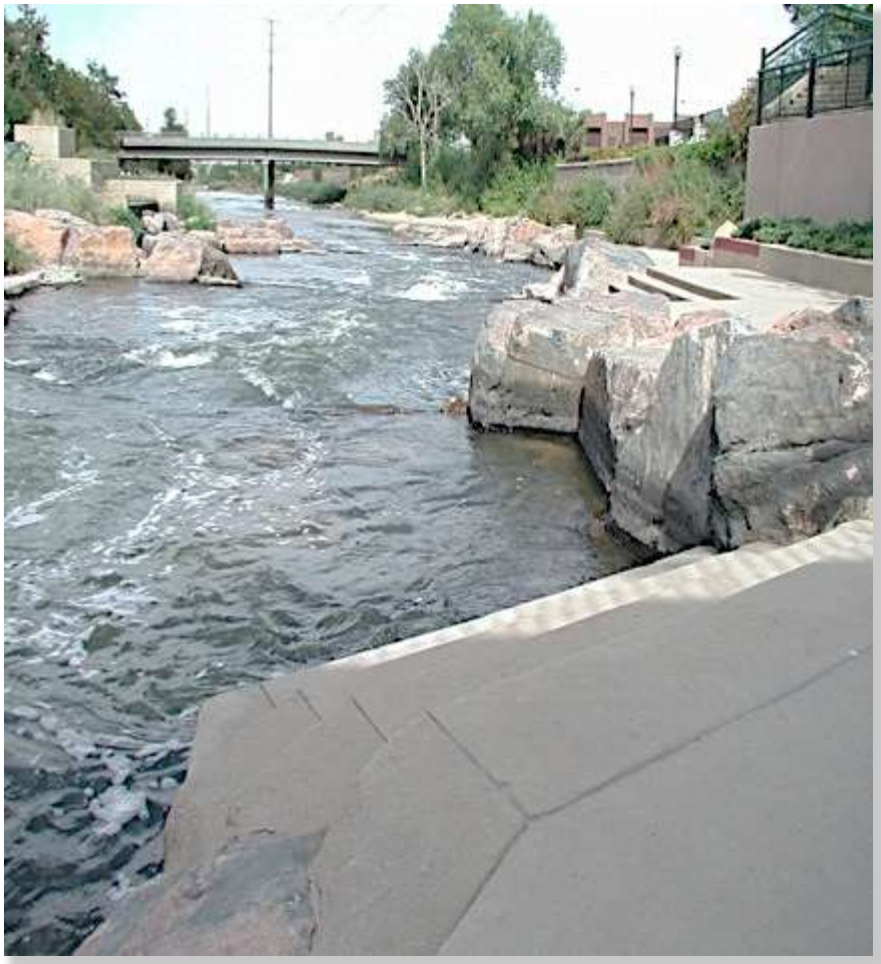
Wooden Stairs Case Study: Fisherman's Bridge 3



Profile View of Fisherman's Bridge

Wooden Stairs Case Study: Fisherman's Bridge 4

Concrete Stairs



Concrete stairs are particularly effective in providing access along steep shorelines. They are durable and easily maintained and may be used in areas where water levels change dramatically, as they are likely to withstand currents and offer access at a range of water levels.

Materials
Variations and Specifications
Advantages / Disadvantages
Case Study

Concrete Stairs: Materials

Concrete can provide a level and lasting access point. Once a bank is prepared to accommodate the stair dimensions (which may require some digging out with equipment, such as a backhoe), a concrete foundation is created, which can be poured into molds reinforced with rebar or metal (left). A less expensive option can be built using pre-molded concrete slabs for the steps supported laterally by rocks found on site (right).

Sandy River boat launch, ME

Example of pre-molded concrete slabs for steps using rocks found on site

Concrete Stairs: Variations and Specifications

- If steps are tapered in width as they descend to the water, the bottom steps should not be too narrow. Paddlers need at least 5’ and preferably 6’ to 12’ for launching.
- Handrails may be needed to provide additional support to paddlers where shorelines are excessively steep. They may not be needed in areas with shorter distances to the water or on less dramatic slopes.
- Installing a 4’ to 8’ staging platform at the bottom of concrete steps can be useful to paddlers. This may serve as a place where kayakers can get into their boats, put on their spray skirts, and slide into the water.

Concrete Stairs: Photo

Steep shoreline grade prevents site from being entirely accessible: concrete stairs provide access to base of an accessible trail.

Concrete Stairs: Advantages and Disadvantages

Advantages

- Provide effective solutions to a steep slope or eroding bank
- May be more aesthetically pleasing than concrete ramps or mats
- Can be combined with boat slides to provide easy transport of boats to water
- Require relatively little maintenance; durable

Disadvantages

- Are not as easily accessible as concrete ramps or other launch types
- Can be expensive
- Not accessible to all
- May require use of heavy equipment for preparation of bank before installation
- Long-term maintenance must be done by hand, which may be unrealistic for some
- Inappropriate for high-scour or high-sediment-deposition setting, or where debris and ice are likely to damage stairs

Concrete Stairs: Case Studies

Confluence Park, South Platte River, Denver, Colorado

White Rock Park, Colorado River, La Grange, Texas

Concrete Stairs Case Study: Confluence Park, South Platte River 1

At the confluence of two rivers in downtown Denver, sets of concrete jetties offer river access at varying water levels. The whitewater course is part of a revitalization project along the South Platte River that began in the mid-1970's.

Concrete Stairs Case Study: Confluence Park, South Platte River 2

Concrete Stairs Case Study: Confluence Park, South Platte River 3

Concrete Stairs Case Study: Confluence Park, South Platte River 4

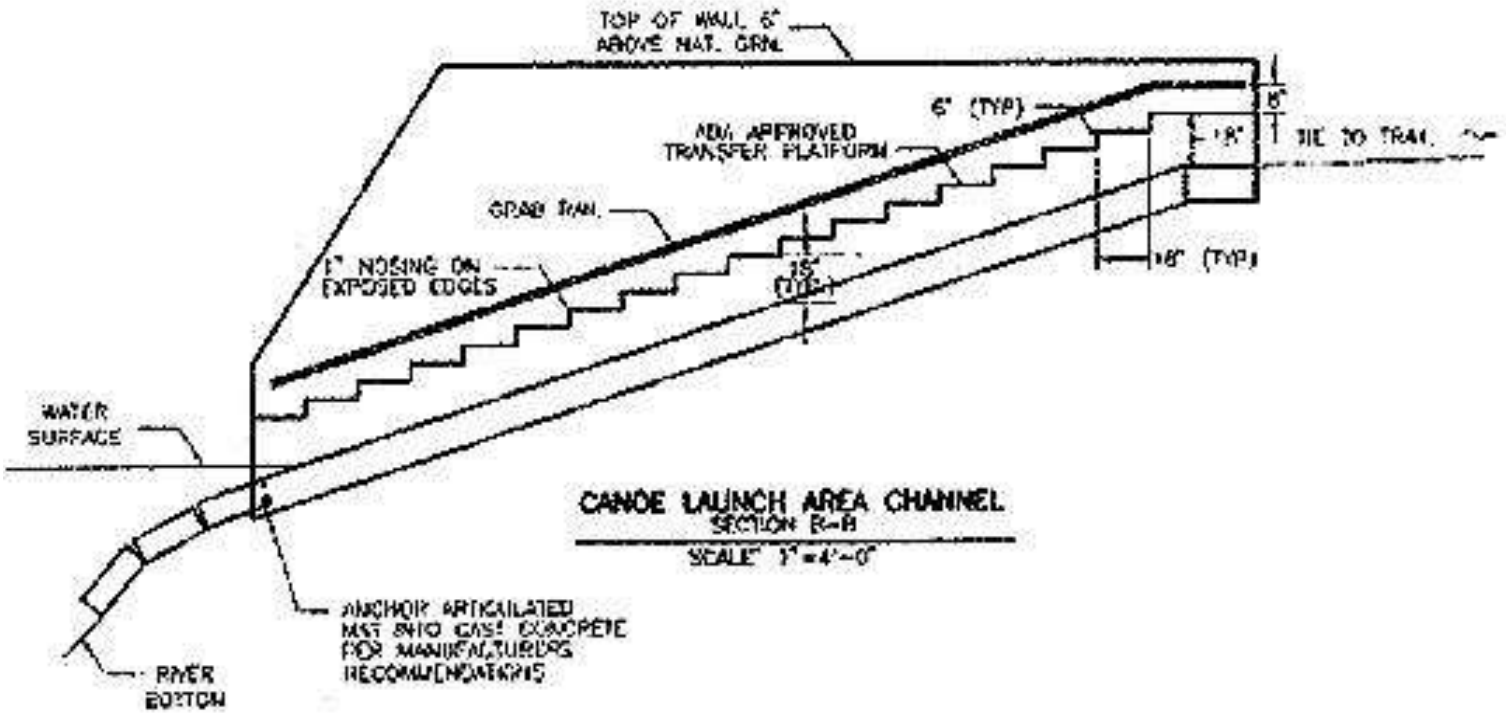
Concrete Stairs Case Study: White Rock Park, Colorado River 1

- Developing a launch site that is accessible to all on an excessively steep slope can prove difficult, particularly if the slope cannot be leveled. However, providing at least one accessible route to the launch area can make the site more accessible to paddlers with disabilities, who may be able to maneuver the transition with some assistance. This is clearly not a preferable accommodation, but it is what was realistic for this particular site.

- At White Rock Park, an accessible route was developed to the top of a concrete stairway launch area by leveling a 40’ cutback to 10’ through several switchbacks along a concrete trail. Every 30’ or so along the trail, level resting points were installed to accommodate wheelchairs. The actual launch, a concrete staircase, was built to accommodate the short 10’ drop to the water and to withstand mud accumulation after flooding. A transfer plate, or level platform, adjoins the staircase, providing an area where one can dismount a wheelchair and either lower themselves down the staircase or be assisted to their boat.

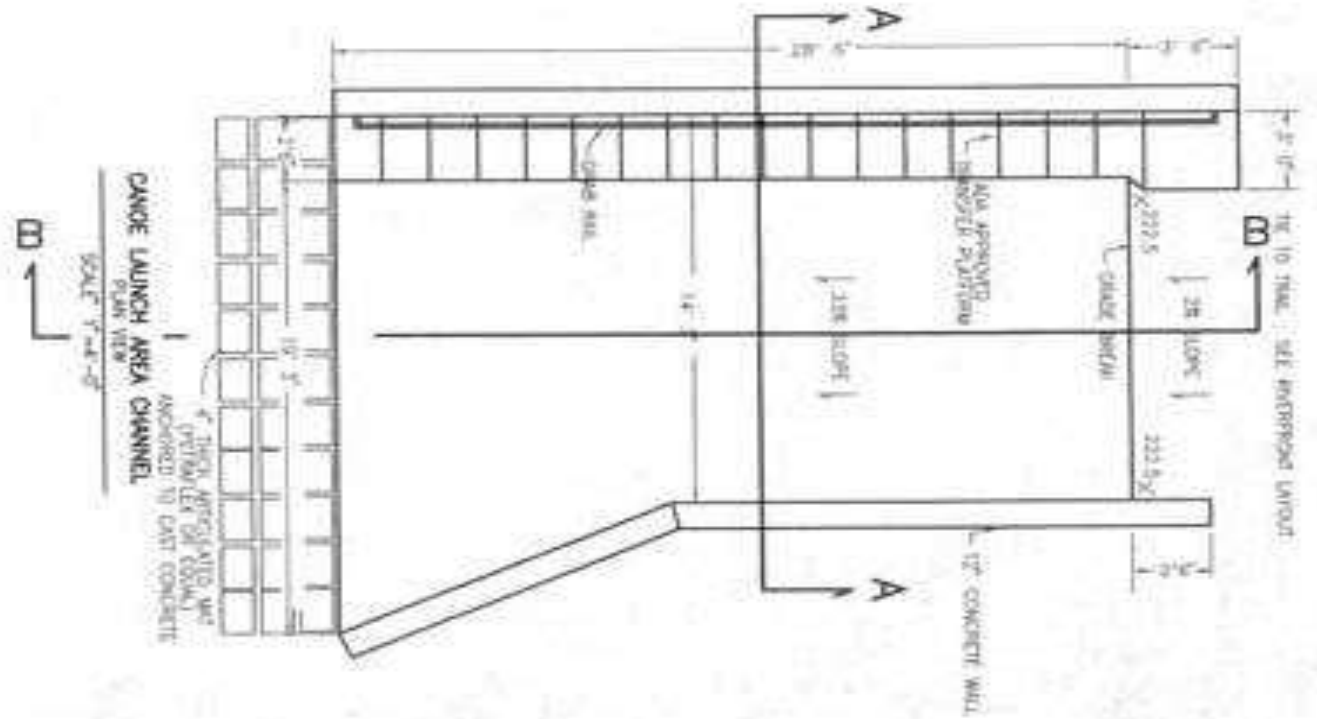
Concrete Stairs Case Study: White Rock Park, Colorado River 2

Side Profile



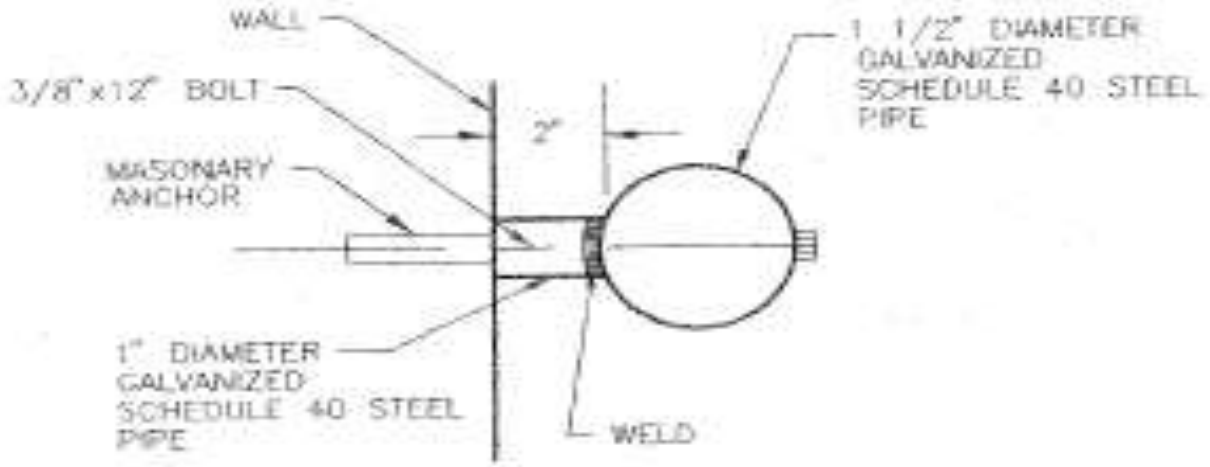
Concrete Stairs Case Study: White Rock Park, Colorado River 3

Bird's Eye View



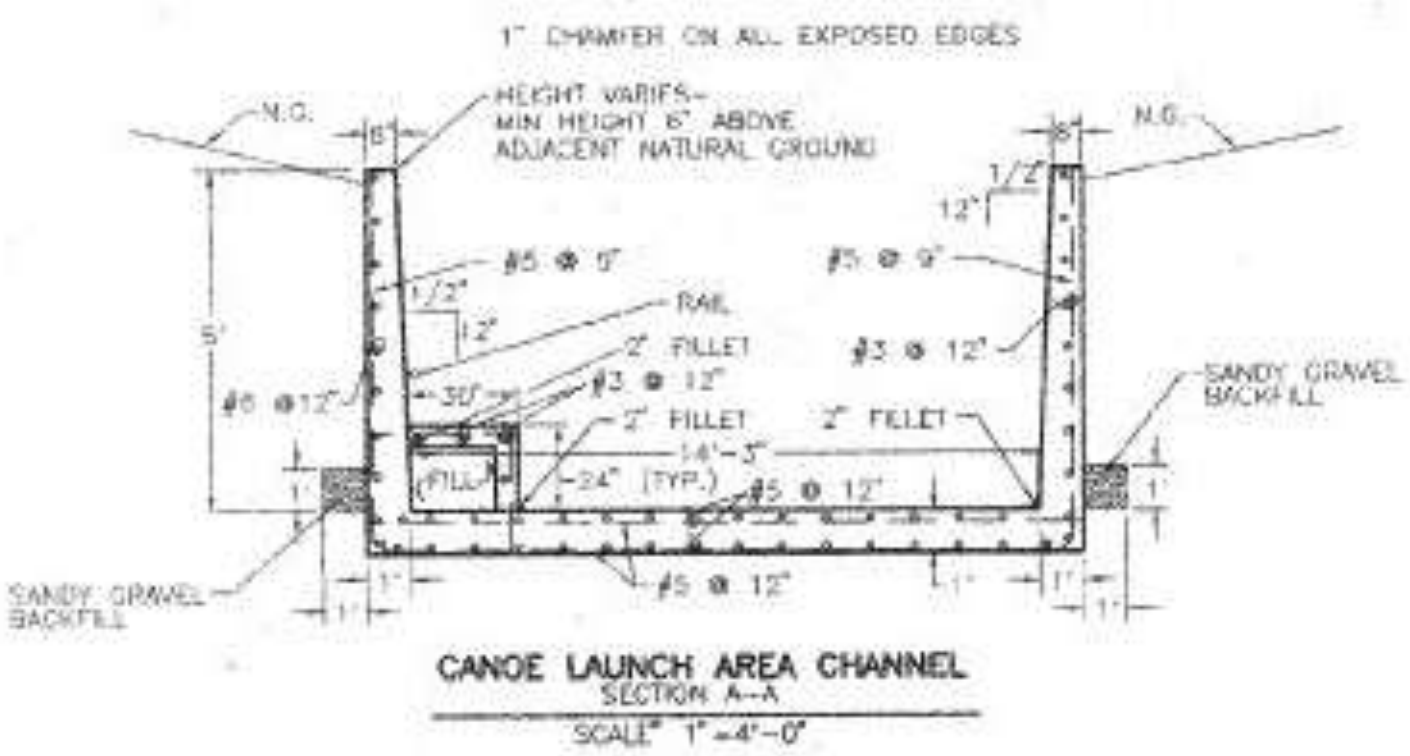
Concrete Stairs Case Study: White Rock Park, Colorado River 4

Detail of Grab Rail



Concrete Stairs Case Study: White Rock Park, Colorado River 5

Canoe Launch Channel



Docks / Piers (Floating Or Fixed)

Docks / Piers

A pier or dock can be used independently as a launch or in combination with other structures. They are able to span marshes or shallow areas to enable launching in water of sufficient depth.

Cantilevers

Cantilever launches extend out over the water from the shore, sometimes appearing to float on the water.

Floating

Floating launches are structures that provide access while floating on the water. Typically composed of a deck, frame, and floats, they are anchored to the shore.

Docks / Piers

- Pier structures can be used independently as launches or in combination with other structures. They can span marshes or shallow areas to enable launching in water of sufficient depth.
- In some cases, “approach pads” or walkway structures are designed to enable access to the launch itself. Structures are composed of a deck and frame, which stand above water level at all times, and are supported by piers. While piles can be used in any depth of water, pipes rest on supports (usually concrete pads) and are not suitable for deep water.

Materials

Variations and Specifications

Advantages / Disadvantages

Photo Examples

Docks / Piers: Materials

- Decking is frequently made of wood, concrete, or wood-alternative materials
- Piles are usually made of treated timber, steel pipes, or concrete
- Pipe with diameters 1 1/2” and 3” is often

Kayak launch from wooden dock

Treated timber piles on wooden dock

Environmental Impact of Pipe and Pile Installation

- Pier design and construction can create negative environmental impacts, as well as health ramifications for those involved in their construction. Piling methods should be researched for those involved in their construction. *Wetland Trail Design and Construction*, produced by the US Forest Service, is a resource that discusses pile installations in depth.

- While there is limited research available on the environmental impacts of piling, some methods clearly cause less disruption to sediments and vegetation than others. The process of "diving," for example, is significantly less disruptive than "jetting," which uses high-pressure hoses. Disturbances to sediments in sandy areas can be greatly reduced when low-pressure pumps are used to create an initial hole and sharpened piles are installed with a drop hammer.

Environmental Impact of Wood Preservatives

- According to some studies, the greatest likelihood of water contamination from a launch construction occurs from preservatives that are applied to pilings or floats in locations that come into regular contact with water. Many states have banned the use of oil-based preservatives containing creosote (CRT) or pentachlorophenol (PCP) in aquatic areas due to their demonstrated toxic effects from leaching, since soluble components separate and leak into the water.
- The US Government has banned the sale and use of what used to be the most common material used in pressure-treated wood used for pilings and decking, chromated copper arsenate (CCA).
- ACQ, an alternative to CCA, is a water-based wood preservative that prevents decay from fungi and insects (i.e., it is a fungicide and insecticide). There are currently four AWPA standardized ACQ formulations, ACQ Types A, B, C, and D. The different formulations allow flexibility in achieving compatibility with different wood species and end use applications.
- Water-based preservatives like ACQ leave a dry, paintable surface. ACQ is registered for use on: lumber, timbers, landscape ties, fence posts, building and utility poles, land, freshwater and marine pilings, sea walls, decking, wood shingles, and other wood structures.
- More information on ACQ can be found here: EPA: Pesticides Regulation

Best Management Practices for Treated Wood in Aquatic and Wetland Environments

Docks / Piers: Variations and Specifications

- Water level should be lower than the level of the deck at all times
- Pier legs need cross bracing and bracketing to the frames for reinforcement and stabilization, as seen in the photo to the right.

Docks / Piers: Advantages and Disadvantages

Advantages

- Effective in areas of strong current
- Stable surface for launching
- Good choice for providing access to paddlers with disabilities; handrails or step-downs may be easily added
- Usually requires shoreline alteration
- Relatively inexpensive
- Easily visible from rivers
- (Pipe docks) Can be easily adjusted or removed

Disadvantages

- Does not accommodate extreme variations in water level
- (Piles) Can have damaging environmental impacts, such as altering currents if they disrupt flows or sediments
- (Piles made of treated wood) Can contaminate water

Docks / Piers: Photo 1

Docks / Piers: Photo 2

Cantilevers

Cantilever launches extend out over the water from the shore, sometimes appearing to float on the water, as seen in the image below. Their main supports on shore often include anchors that are partially submerged in water.

Materials

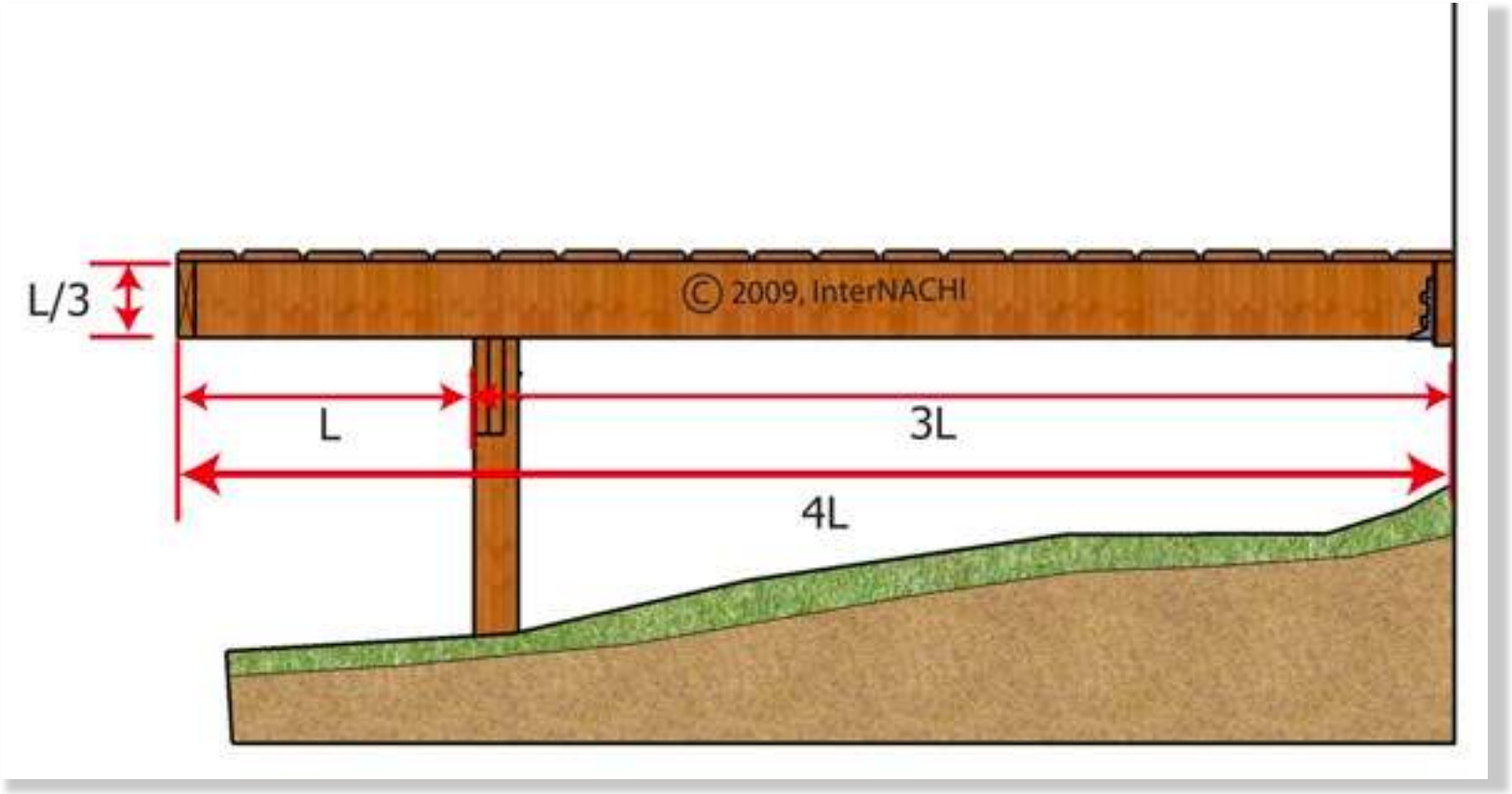
Variations and Specifications

Advantages / Disadvantages

Plans

Cantilevers: Materials

Frequently made of wood, with steel or wood supports



Cantilevers: Variations and Specifications

- Can be used as a launch on its own or connected to other launch structures.
- Anchor and frame must be built to accommodate weights of the launch, boats, and paddlers.
- Engineers should be consulted to determine if a cantilever structure is the best option given the launch's level of use.

A cantilevered dock on the Wisconsin River

Cantilevers: Advantages and Disadvantages

Advantages

- Can provide access in environmentally sensitive areas while protecting riparian habitat and shoreline vegetation
- Suitable in a wide range of locations and shoreline configurations
- Can have removable deck sections or posts
- Relatively inexpensive

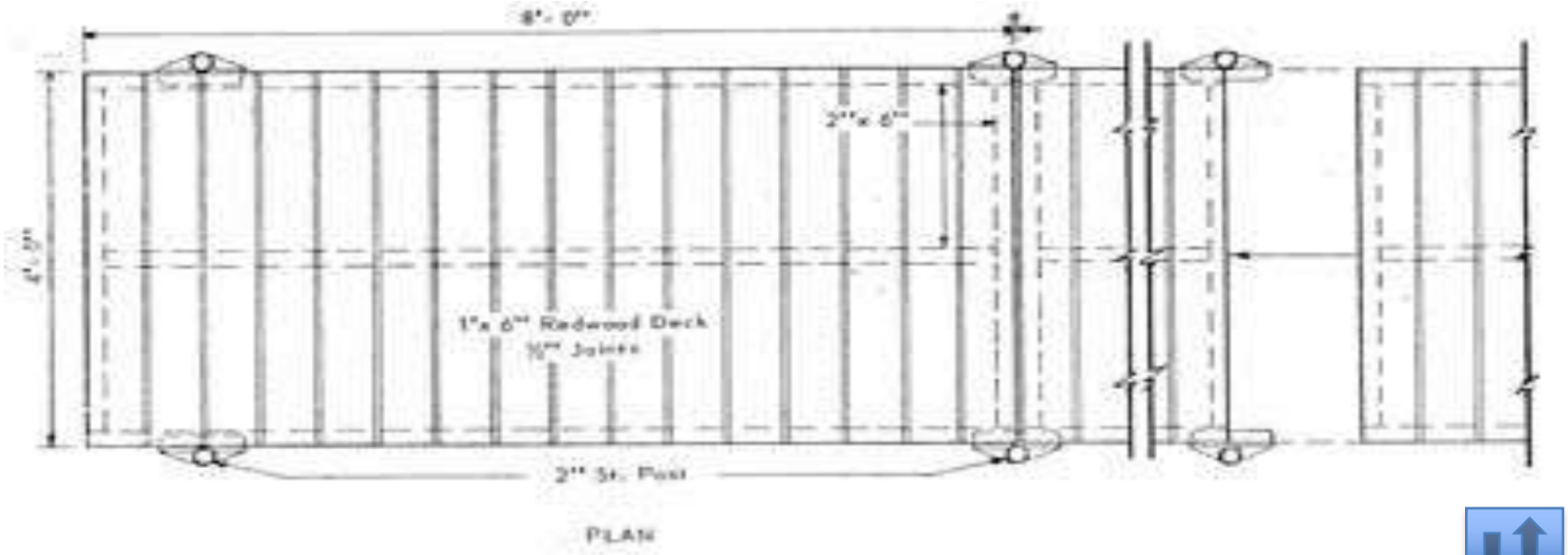
Disadvantages

- Load capacity is limited; cannot support excessive weight
- Treated wood can be hazardous to the environment
- May not last as long as a fixed or floating launch due to support and weight limitations

Cantilevers Case Study: Minnesota Division of State Parks 1

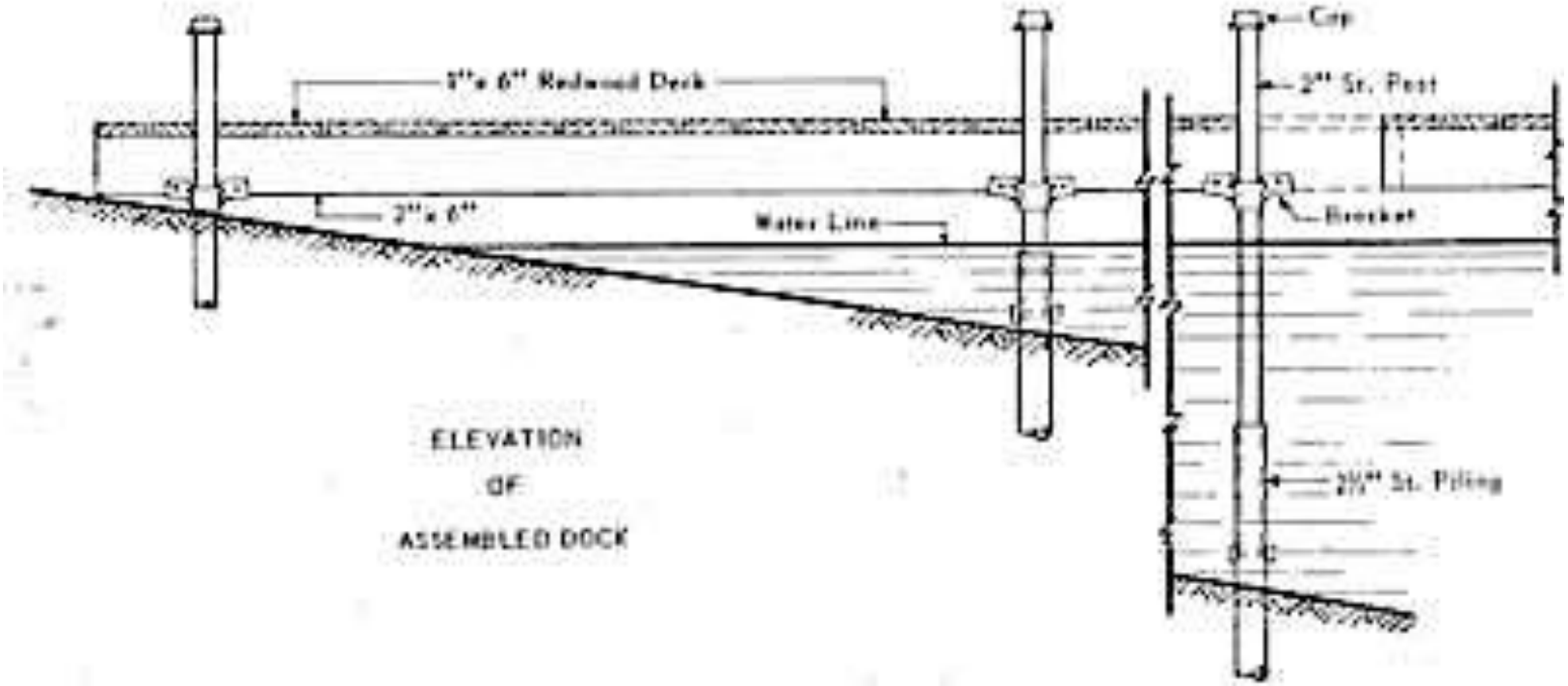
This cantilever launch is composed of deck sections and posts that can be removed seasonally. 2 ½" footing pipes with cross bolts in place are installed into the shore bottom until they are firm (18" to 24" below the water surface). 2" pipes are installed through metal deck brackets and into pipes, capped on upper threaded ends. Deck is leveled by set screws in brackets. Dock can be unbolted when screws are loosened and 2" pipes are removed. Dock sections can be removed, leaving the footing pipes in place.

Bird's Eye View



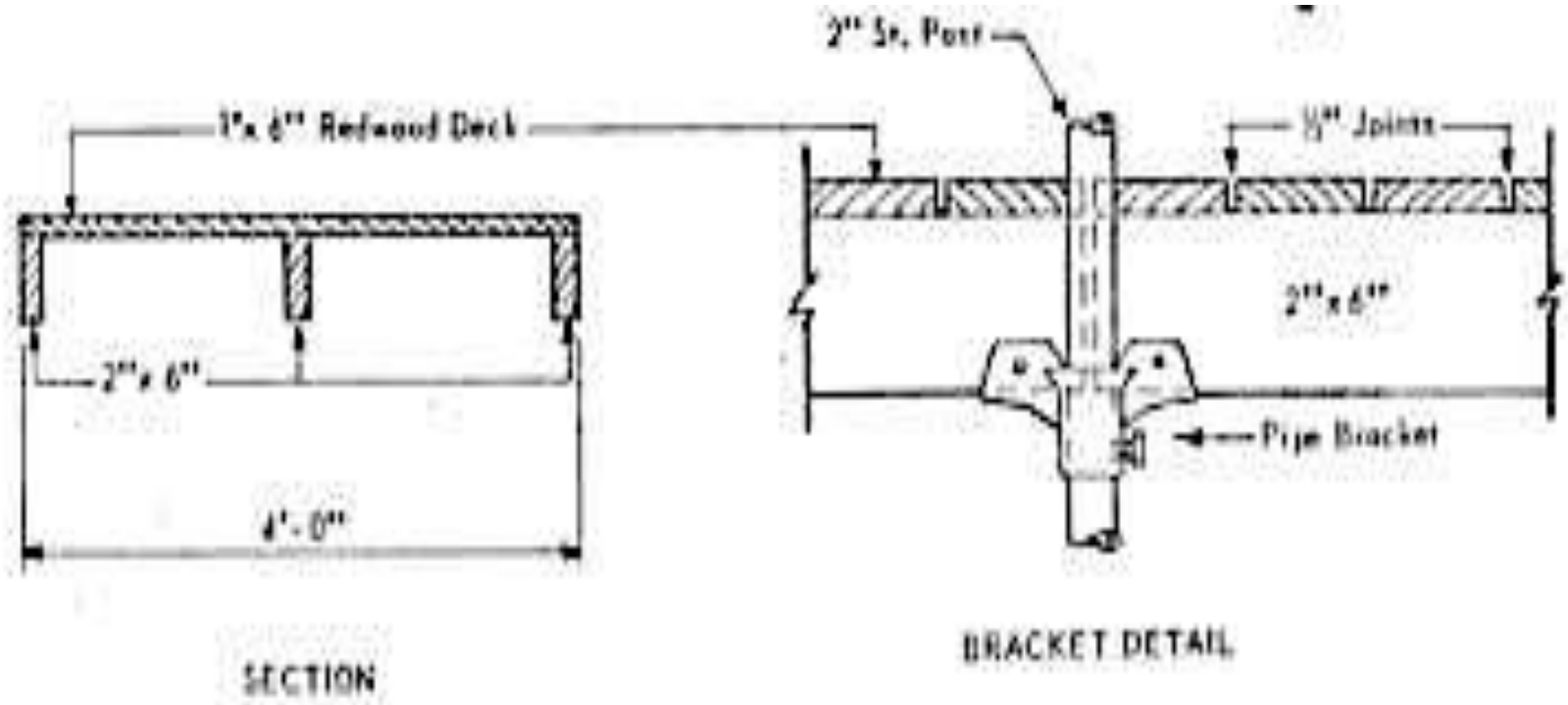
Cantilevers Case Study: Minnesota Division of State Parks 2

Side Profile



Cantilevers Case Study: Minnesota Division of State Parks 3

Front Profile



Floating

Floating launches are structures that are not built into the bottom of the water body. Typically composed of a deck, frame, and floats, they are anchored to the shore. Paddlers launch from the deck, which is supported by the frame, while the floats beneath the frame provide buoyancy. Anchoring devices help to stabilize the launch and protect it from the elements. Pile guides are often used, allowing launches to adjust to changing water levels while keeping their decks horizontal and steady. When floating launches attach to connecting structures with varying heights (e.g., gangways), pile guides can help to maintain a relatively small cross slope, making launches more likely to be accessible to paddlers with disabilities.

Floating launches are most effective when used on water with little debris and minimal exposure to strong currents or waves. In general, they can withstand flow rates up to 0.25 feet per second. Floating launches should be removed and secured during flooding or high flow events, and unless they are specifically designed to endure ice formation, they should be removed before freezing occurs.

Materials
Variations and Specifications
Advantages / Disadvantages
Case Study

Floating: Materials

Decks | Frames | Floats

Concerns with Plastic and Wood Products

- A variety of materials can be used for the decks, frames, and floats that make up a floating launch. Consider the durability needs of your launch site when choosing your materials. Plastics are regularly used for this launch design and have various levels of durability.
- Treated wood is also commonly used for floating launches. Treated wood must be used with caution in regard to the environment and to the health of those involved in construction. While treated wood can last up to five times as long as untreated wood, there are risks involved with their preservatives and chemical treatments.

Pressure treated wood frame

Floating: Materials

The following vendors carry floating launch products and supplies. This is not an exhaustive list and is meant as a sampling. It is also not an endorsement of these companies or their products.

Mod-U-Dock	Flotation Systems, Inc.®	JetDock
Connect-A-Dock	GatorDock™	Dock Floats Ltd.
Traveldock™	Tiger Docks	Alumidock®
CMI Waterfront™ Solutions	ShoreMaster	Johnston's Docks

Floating: Deck Materials

- Wood is simple and inexpensive to use; pine, redwood, cedar, and cypress are common choices, but they will not last very long unless treated with a preservative.
- Metal decking, such as aluminum, is used mainly for heavy-use launches that also serve motorized boats. Metal grating provides effective drainage and traction.
- Alternative materials include wood/plastic composites, vinyl, and various plastics made of recycled materials that are made to look like wood. These materials may be more expensive and require additional support devices, but are more resistant to damage and warping than wood, and require less maintenance.

Galvanized steel frame floating dock with marine-grade PVC. No toxic chemicals are in this recyclable decking.

Floating: Frame Materials

- Wood - Often used, but will last only 2 to 3 years if untreated
- Metal - Either lightweight aluminum or galvanized metal
- Plastic - Water resistant and will not degrade in water as rapidly as other materials
- Steel tubing - Used for floats and frames, and attaches to deck with brackets. Steel can be coated to increase durability.

Aluminum framed floating dock with non-slip deck surface

Floating: Float Materials 1

- Polyethylene, the most frequently chosen plastic, can function as both a frame and float; they may have grooves and brackets that easily attach to shoreline structures or floats may have built-in cleats, which facilitate anchoring.

- When expanded polystyrene foam (EPS) is used, the best choice is extruded closed cell because it has the strongest inner structure; it must be used with a protective covering to prevent damage from chemicals, water, and debris.

- Plastic float drums made of rotationally molded polyethylene are more durable than EPS and provide protection from impact damage, animals, and the effects ultraviolet (sun) light; these are most effective when filled with EPS, which act as shock-absorbers and protect drums, if damaged, from losing buoyancy.

This information is provided by the U.S. Forest Service publication entitled *Floating Trail Bridges and Docks*

Floating: Float Materials 2

- Fiberglass float drums are not as strong as plastic float drums or as readily available, but they are lightweight and water-resistant. Fiberglass will degrade in sunlight over time more than most plastics.

- Foam-filled tires provide effective stabilization in areas with heavy debris or current; these can be made of recycled tires filled with EPS and capped with plywood. Commercial versions are available that are pre-made sealed and attached.

- Recycled 50-gallon cooking oil drums can also be used, but must be cleaned professionally to safeguard against contamination. Motor oil drums or any drums that have held noxious or hazardous materials should never be used.

- Concrete floats are sturdy and stable, but are also costly and heavy.

- High-density polyethylene (HDPE) can be used for both flotation and for framing, as seen in the image to the right.

Floating:
Variations and Specifications

- May be used in combination with bridges, gangways, fixed piers, or bulkheads to enable paddlers to put-in at water of sufficient depth. These structures may be attached with hinges and used across shallow areas to provide access to a floating dock; they should have slopes of less than 20 degrees (or no more than 8.33%) and should remain horizontal at high water levels. Equip with handrails to offer maximum stability for users.
- May be used in combination with elevated walkways or geotextile mats in environmentally sensitive areas, in order to prevent damage to riparian areas.
- May be used in combination with motorized boat ramps to enable hand-launching
- Needs a deck that rises at least 2 feet above water to enable safe access
- Should float on at least 3 feet of water
- Should not rest too high above the surface of the water, as this can make transitions from canoes and kayaks difficult

Floating: Advantages

Advantages

- Adjusts to fluctuating water levels – (it's always the "right" height)
- Provides a sturdy surface, and a solution to unsafe conditions or inconvenient access
- Has few long-term environmental effects
- Is easily removable in inclement weather or heavy flows, and may therefore requires less maintenance
- Provides an alternative to gravel ramps that will erode in areas of stronger waves or currents
- Is easy to purchase and assemble; allows for flexibility in design
- When wet, is not as slippery as launches with sloped surfaces
- Is unlikely to scratch boats
- Keeps feet dry during cold weather paddling

Floating: Disadvantages

Disadvantages

- Not appropriate for all access locations. Use should be limited to areas where the minimum water depth is 3+ feet at all times, changes in water level are slow, and exposure to the elements is minimal.
- May not consistently be accessible to all, since slopes of connecting structures may alter with changing water levels. Locks and piles may be used to create a specific elevation and keep the cross slope to a minimum.
- The launch may be exposed to stronger currents than it can withstand and additional structure may be needed.
- The anchoring process must be carefully considered, as it must take into account particular climate and site conditions. When placing anchor piles, the combination of wind, wave, current, and impact forces should be accounted for.
- Not effective for use in areas where tidal fluctuations are rapid and extreme. Floats may be beached at low tide or floats can disrupt sediments as they rise with high tide.

Floating Launch Design: Case Studies

Janes Island Kayak Dock, Dougherty Creek Canal,
Janes Island State Park, Maryland

Annsville Creek Paddlesport Center, Hudson River Greenway Water Trail
Hudson Highland State Park, New York

Bladensburg Waterfront Accessible Launch,
The Maryland-National Capital Park and Planning Commission

Floating Launch Design Case Study: Janes Island Kayak Dock

Problem:

- Paddlers needed an alternative launch site at a busy marina. The existing concrete boat ramp was crowded with powerboat use and its slippery surface and steep incline made it hazardous for paddlers. Since the entire shoreline is bulk headed, there were no “soft landing” alternatives to provide paddlers with access to the water.

Solution:

- Maryland Department of Natural Resources purchased a floating 8’ x 20’ dock designed specifically for canoes and kayaks that attaches to bulkhead pilings with metal rings. The new launch was placed outside the entrance to the marina basin so that paddlers do not have to cross incoming and outgoing boat traffic into the basin. Paddlers access the launch from a ladder, so it is not easily accessible to those with disabilities.

Floating Launch Design Case Study: Janes Island Kayak Dock Specifications

Deck:

2’ x 6’ with 3” x 6” side stringers

Frame:

Wood, 2’ x 6’ cross stringers, ¼” steel brackets reinforce outside corners

Floats:

Polyethylene shell filled with foam, 8” x 20” x 72” long

Floating Launch Design Janes Island Kayak Dock Photo 1

Floating Launch Design Janes Island Kayak Dock Photo 2

Floating Launch Design Case Study: Annsville Creek

- Commercially manufactured floating launches may be used in combination with other structures, such as gangways or pier launches. Wholesalers sell floating launches built of pre-fabricated modular sections that can be connected together to adapt to site specifications.

- The following photos and designs portray access at Annsville Creek to the Hudson River Greenway Water Trail, a tidal river with water levels that may fluctuate 4 feet between tides.

- Several different structures are used at this site to accommodate paddlers at different water levels: a modular polyethylene floating launch connects to a wooden floating dock that is accessible from a concrete landing on the shore via two parallel aluminum gangways. The floating launch has four kayak slots or boat slides, where paddlers can easily transition into and out of the water. The entire launch configuration is accessible and is used to teach paddlers with disabilities, as well as to train instructors who teach paddlers with disabilities.

Floating Launch Design Case Study: Annsville Creek Specifications

Floating Launch:

22’ wide x 30’ long; structure made of 234 polyethylene polymodules.

Wooden Floating Dock:

8’ wide x 30’ long, connects to floating launch and two transition plates.

Transition Plates:

Two parallel aluminum gangways, each 4’ wide x 25’ long at shoreline; extends into water 42” below shoreline level

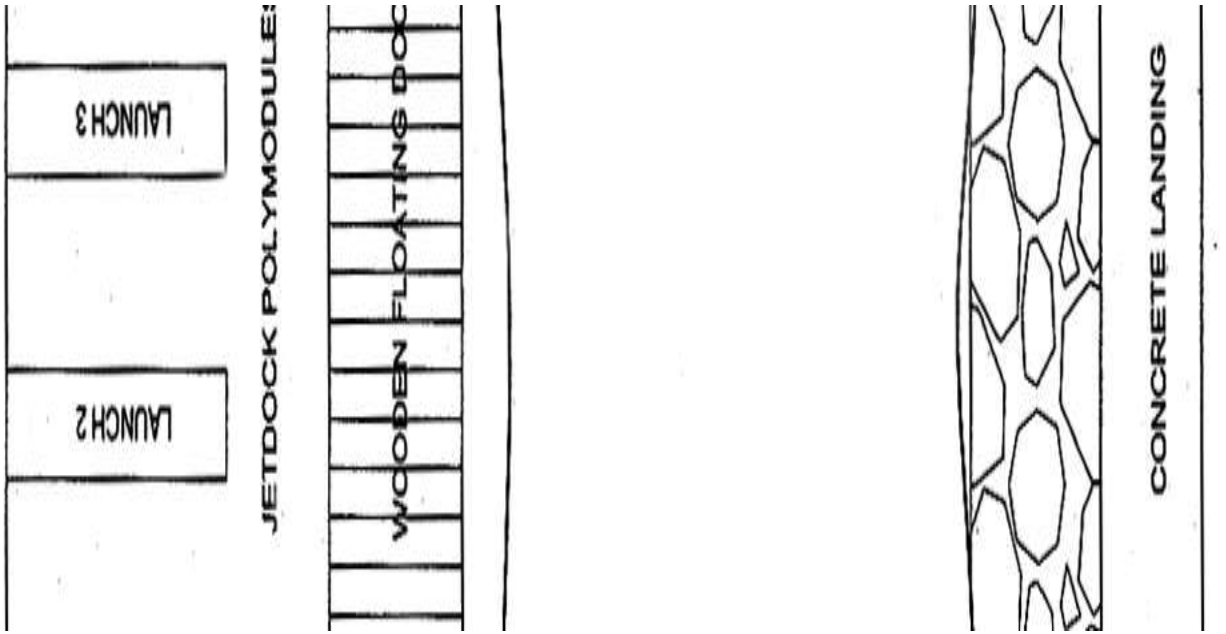
Reinforcements:

Rip-rap extends from edge of concrete landing across half of gangway length

- Total width of kayak slots = 16.67’
- Small, upright, inverted modules on outer edge of launch are vented to allow for adjustment.

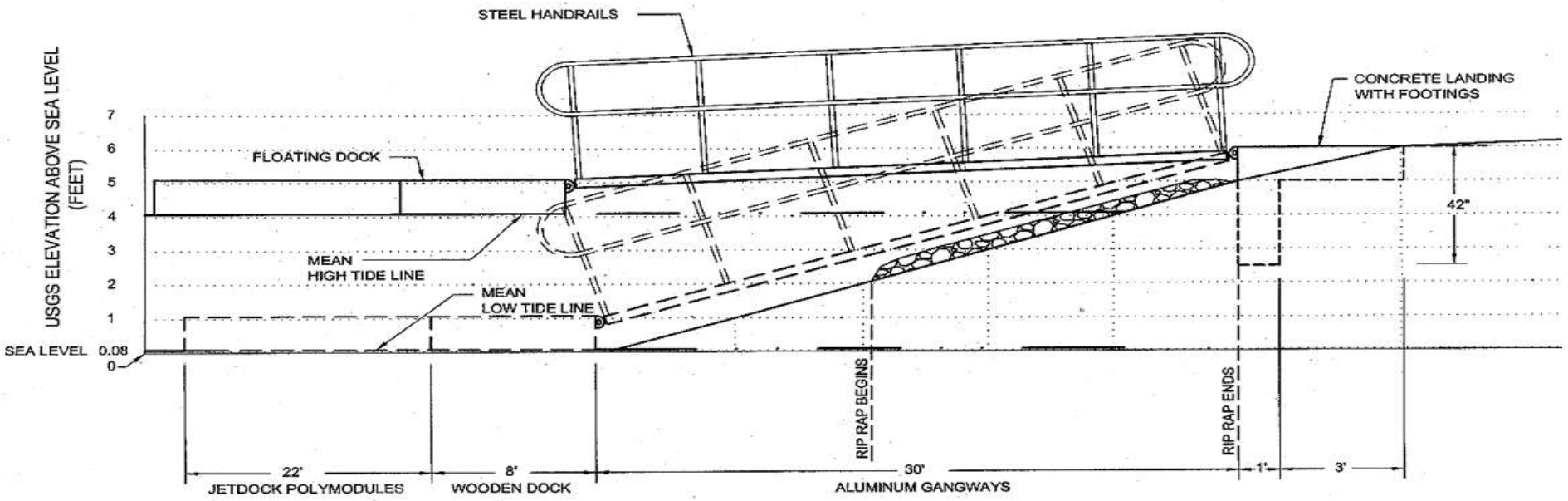
Floating Launch Design Case Study: Annsville Creek 1

Bird's Eye View



Floating Launch Design Case Study: Annsville Creek 2

Profile View



REVISED FLOATING DOCK ANCHORAGE SYSTEM

Floating Launch Design: Annsville Creek Photo 1

Floating Launch Design: Annsville Creek Photo 2

Floating Launch Design: Annsville Creek Photo 3

Floating Launch Design: Annsville Creek Photo 4

Floating Launch Case Study: Bladensburg Waterfront Launch Photo 1

Floating Launch Case Study: Bladensburg Waterfront Launch Photo 2

Elevated Walkways and Portages

The main focus of this guide is launch development, but an important additional element of site design is creating appropriate pathways to launch sites.

Elevated Walkway Design

Portages

Elevated Walkways

Elevated walkways are raised structures that allow paddlers to access launching areas without having direct contact with the ground. They are effective in minimizing potential impacts from recreational use on riparian habitats, fragile shorelines, or other environmentally sensitive areas. While providing a stable surface, elevated walkways can also prevent erosion, protect existing vegetation, and promote vegetation of damaged areas. Elevated walkways usually let light penetrate to the ground below so that vegetation beneath them receives the sunlight necessary for growth.

Materials
Variations and Specifications
Advantages / Disadvantages
Photo Examples

Elevated Walkways: Materials

Typically constructed from expanded metal, aluminum, fiberglass, or wood. They are most effective when used with tripods or other above-ground supports. These can include posts that are driven into the bank; however, posts should not be installed too close to the edge of the bank, or they may contribute to erosion. If a ladder is used, it should have minimal contact with the bank or shoreline vegetation at all water levels. Shorter walkways are preferable so that wildlife may access water easily.

Elevated Walkways: Variations and Specifications

Elevated walkways are versatile:

- They may be combined with other walkways or connecting structures to provide access to floating or other types of launches.
- They may be attached to stairs or ladders that lead to launch structures or rest on the bottom of a river or lake.
- They can be cantilevered over a river while supported by a tripod.

Elevated Walkways: Advantages and Disadvantages

Advantages

- Keeps people off vegetation
- Allows native vegetation to grow
- Provides access and directs people to recreational sites
- Protects investment - stream bank and restoration work
- Prevents trampling and erosion of vegetation
- Protects fish and wildlife habitat

Disadvantages

- Moderately expensive
- Requires maintenance
- May need to be seasonally removed, at least partly
- Drilling pipe for walkways requires heavy machinery and may be difficult and destabilize banks
- Aesthetics - not natural structure

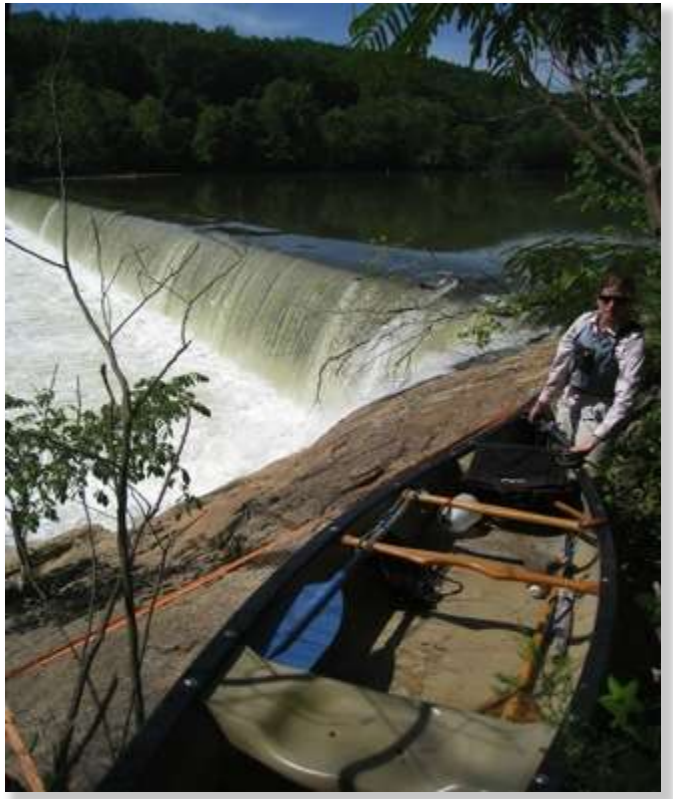
Elevated Walkways:
Bladensburg Waterfront Launch Photo 1

Elevated Walkways:
Bladensburg Waterfront Launch Photo 2

Portages

Portages are land routes used to transport boats to and from a launch area or between access sites. Where dams or other obstructions interrupt a paddling route, portages can provide a direct, often less hazardous path from one water access point to another.

Portages can also serve as detours around difficult sections of water that paddlers choose not to run, and they may serve as navigable connections between lakes or other bodies of water, helping to create a continuous paddling route. While this chapter discusses designs for portages around dams, the information provided may be applicable to portages in each of these settings.



Materials

Variations and Specifications

Advantages / Disadvantages

Case Study

Portages: Materials

- Portages can be simple routes, such as trails made of soil, gravel, or asphalt. They can also be built structures, such as staircases with chutes or slides. The materials used and amount of construction necessary will depend on circumstances at an individual site such as the shore configuration, frequency of usage, dam ownership and available funds.

- Signage is crucial to making a portage visible to paddlers and for informing them about potential hazards on the water. Regardless of their visibility from the water, portages should be clearly marked in order to provide paddlers with sufficient time to reach the shore and take out. Clear and appropriate signage should discourage paddlers from attempting to clear a low head dam or spillway.

Cheoah River Roadside Portage
Alcoa Power Generating Inc.

Signage example from New River Trail State Park

Portages: Regulations

- Some dam owners have installed signage to educate paddlers about potential dangers. Dams for hydropower use may be required to have signage. The Federal Energy Regulatory Commission (FERC) provides regulatory oversight at hydropower dams to help develop and maintain a low hazard environment for the public, and considers designated and well-marked portages to be crucial communications tools to inform paddlers portaging around, putting in, or taking out at a hydropower dam.

- Licensing requirements issued by FERC require hydropower applicants to review recreational needs in the areas around their facilities. Licensees must assess and update the capacity of their public recreational facilities during the term of the license.

- For further information on the relationship between hydropower licensing and recreational use and liability, see:

"Hydropower Relicensing and Recreational Liability"

Portages: Variations and Specifications

- According to *FERC Guidelines for Public Safety at Hydropower Projects*, a portage should not be located within 300 feet of a dam, spillway, or powerhouse.
- The following general recommendations for portage areas are gathered from several sources, including an April 2003 assessment of the Trinity River in Texas.

- An effective Portage should include:
  - Clear, well-marked signage allowing paddlers sufficient time to reach shore before the take-out
  - A path at least 2’ wide around the dam, with a slope no steeper than a 1:3
  - An accessible portage featuring a slope that does not exceed 8.33% or 1:12
  - At least 8’ overhead clearance on the path and 4’ to 8’ clearance on either side
  - A vertical distance of 12” or less between the height of a boat and shore
  - A route that minimizes the distance that paddlers must carry their boats
  - Access points located on inside bends or areas of calm water
  - A backup or second path downstream from the portage access point upstream from a dam, when possible, giving paddlers an additional second opportunity area to take out.

Portages: Advantages

Advantages

- Provides defined and safe routes around dams and other structures that can be obstacles for paddlers, as long as they are well located and clearly marked
- Enables paddlers to navigate a somewhat continuous route along a water trail
- Gives paddlers designated routes to transport their boats between parking areas and launch sites
- May prevent damage to riparian or other sensitive areas by directing paddlers to a designated route

Portage that requires only occasional maintenance

Portages: Disadvantages

Disadvantages

- May not be easy for paddlers to manage while transporting their boats, if portages have a steep slope, uneven surface, or limited space
- May not provide paddlers with sufficient time or space to take out, especially if currents or winds are strong, if portage is located immediately upstream of a dam or other obstruction
- May be difficult to locate or access if not clearly marked

An extremely low maintenance and rather tough portage to navigate!

Portages Case Study: Pejepscot River Access

Pejepscot River Access, Androscoggin River, Lisbon Falls-Brunswick, Maine

Pejepscot Dam, Androscoggin River, Maine

Portages Case Study: Pejepscot River Access

Problem: One of the largest rivers in Maine, the Androscoggin hosts 28 dams along its 170 river miles. Not all of the dams have navigable routes around them; some require excessively long portages or do not provide portage trails at all. Other dams have portage trails that provide access both upstream and downstream. Most portage trails are marked with signs, however dam warnings are not easily visible on all sections of the river.

Solution: The Pejepscot River Access, downstream of Lisbon Falls, offers a solution to launching from a steep, rocky, and unstable shoreline where boulders, rock fragments, and fallen tree limbs make river access a challenge. Takeout occurs just above the dam, and a short portage through the woods connects paddlers with access just below the dam. A metal staircase, with a handrail on one side and a carpet-covered wooden slide on the other, enables paddlers to easily maneuver their boats down to the water. The carpet provides traction and helps to protect boat bottoms from damage. The staircase leads to a rocky, but sturdy and level launch area at the water's edge.

Portages Case Study: Pejepscot River Access Photos

Steel canoe portage stairway with padded canoe slide in place to allow canoes/kayaks to be slid down to the river for launching

Resources – Chapter 3

- Guidelines for Developing Non-Motorized Boat Launches in Florida – Florida Fish & Wildlife Conservation Commission
- Iowa Watertrails Toolkit – Iowa DNR
- Construction Site Best Management Practices Manual – State of California Department of Transportation
- Wetland Trail Design and Construction – US Forest Service
- Environmental and Aesthetic Impacts of Small Docks and Piers – NOAA Coastal Ocean Program
- Minnesota Division of State Parks
- Floating Trail Bridges and Docks – US Forest Service
- Best Management Practices for Treated Wood - Western Wood Preservers Institute
- Streambank Revegetation and Protection: A Guide for Alaska – AK Department of Fish & Game
- Hydropower Relicensing, Recreational Liability, and Access – American Whitewater
- Guidelines for Public Safety at Hydropower Projects – Federal Energy Regulatory Commission

Photo Credits – Chapter 3

Slide 106: Courtesy of the National Park Service
Slide 107: Courtesy of the National Park Service
Slide 108: Courtesy of the National Park Service
Slide 109: Courtesy of the National Park Service
Slide 110: http://www.greatfallsinformation.com/smithriver/
Slide 111: http://rotj.wordpress.com/category/james-river/kayaking-james-river/
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Slide 119: http://www.conteches.com/knowledge-center/pdh-credits/pdh-article-series/geosynthetics-in-articulating-concrete-block.aspx
Slide 123: Jordan Loran, Maryland Dept. of Natural Resources
Slide 124: Jordan Loran, Maryland Dept. of Natural Resources
Slide 125: http://outdoornebraska.ne.gov/blogs/2012/05/project-updates/
Slide 127: http://www.armortec.com/pages/Applications/Apps_boatramps.html
Slide 128: http://www.diamondjglobal.com/ProductsSolutions/45in(1185cm)ArticulatedConcreteMats.aspx
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Slide 145: Left image – Courtesy of the National Park Service
Slide 145: Right image - http://forums.pondboss.com/ubbthreads.php?ubb=showflat&Number=2063
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Slide 213: M-NCPPC/Cassi Hayden - http://www.mncppc.org/commission_home.html
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Slide 223: Left image: Marshall L. Olson and Oliver L. Ammons presentation: Through Paddling on the Little TN River
Slide 223: Right image: New River Trail State Park - Mark.Hufeisen@dcr.virginia.gov
Slide 226: Lelia Mellen, National Park Service
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Slide 229: Left image – Courtesy of the National Park Service
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- Florida Fish and Wildlife Conservation Commission's 'Creating Successful Paddling Trails' - http://myfwc.com/boating/waterway/paddling-trails/

Accessibility Guidelines

- Design guidelines from Iowa's DNR River Program - http://www.iowadnr.gov/Recreation/CanoeingKayaking/WaterTrailDevelopmentTools/WaterTrailsToolkit.aspx
- Layout, Design and Construction Handbook for Small Craft Boat Launching Facilities by California Department of Boating and Waterways, 1991 - http://www.dbw.ca.gov/PDF/LaunchFac/LRamps.pdf
- Non-Motorized Boating in California (see especially Table 3.1: Overview of Key Facility Needs by Non-Motorized Boat Types in California (2006)) - http://www.dbw.ca.gov/PDF/N-M_Boating/Sec_3-Waterways_and_Facility_Needs.pdf
- American Canoe Association – http://www.americancanoe.org / 'Adaptive' tab

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Accessibility Guidelines (cont.)

- 2010 ADA Standards Excerpts for Recreational Boating Facilities by California Department of Boating and Waterways (2013) - http://www.dbw.ca.gov/PDF/Reports/DBW_2010_ADA_Booklet-Dec_2012.pdf
- 2010 Standards for Accessible Design (9/15/2010) - http://www.ada.gov/2010ADAstandards_index.htm
- Architectural Barriers Act Accessibility Standards (ABAAS) for federal agencies (7/23/2004, updated) - http://www.access-board.gov/guidelines-and-standards/buildings-and-sites/about-the-aba-standards/aba-standards
- Accessible Boating Facilities: A Summary of Accessibility Guidelines for Recreation Facilities (USAB 2003) - http://www.access-board.gov/recreation/guides/
- Final Accessibility Guidelines for Outdoor Developed Areas (9/26/2013) - http://www.access-board.gov/guidelines-and-standards/recreation-facilities/outdoor-developed-areas/final-guidelines-for-outdoor-developed-areas

Prepare To Launch! Resources

Suppliers of Floating Docks

AccuDock: 1336 SW 8th Street Pompano Beach, Florida 33069; 954-785-7557 – www.accudock.com

EZ Dock, Inc: 13620 East Reese BLVD, Suite 300 Huntersville, NC 28078; 888-752-9349 – www.ez-dock.com

Jet Dock Systems, Inc: 1-800-538-3625 http://www.jetdock.com/

Kayak Dock: 877-362-5523 - www.kayakdock.com

Kay-aKcess: PO Box 3092Placida, FL 33946; 941-662-5935 http://www.kay-akcess.com/

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Sources of Soil Stabilization and Surfacing Products

Eco-Terr, Inc: http://www.stabiligrid.com/

Contech: 800-881-1100; http://contech.com-cpi.com

Geosystems: http://www.prestogeo.com/

Soil Stabilization Products Company, Inc.: 1-800-523-9992 or 209-383-3296; http://sspco.com

ThomasNet, Inc.: http://thomasnet.com

Vynagrip, Inc.: (Industrial matting) http://www.vynagrip.com/index.htm

Glossary - 1

ABUTMENT: A masonry structure that supports pressure of an arch or bridge. For purposes of this guide, a wedge-shaped anchor that connects the end of a floating launch with the top of a launching ramp or connecting structure.

AGGREGATE: Sum of many heterogeneous things taken together. For purposes of this guide, a combination of materials (e.g. sand, gravel, slag) mixed with a cementing material to form concrete, mortar, or plaster serves to increase traction.

Walker Pond boat launch with concrete abutment at right

Gravel (on right) adjoins aggregate

Glossary - 2

BIOENGINEERING: The use of live plants and plant parts as building materials for erosion control and landscape restoration.

BULKHEAD: A retaining wall along a shoreline or waterfront.

Natural buffering system called low stone sill helps to reduce wave impact while newly planted native grasses re-establish a fringe marsh.

Stone bulkhead launch wall

Glossary - 3

GANGWAY: A passageway made from planks that enables access. It is often a removable or temporary path used to connect two structures, or to connect a launch or other structure to the shoreline.

CLEAT: A fitting device where a rope may be tied to provide support or anchoring; frequently has two projecting parts.

Glossary - 4

PILE: A long, slender column, typically made of steel or reinforced timber, driven into the ground and used to support a launch or other horizontal platform.

PILE GUIDES: Anchored pile holders that allow for vertical movement of a floating launch while maintaining its connection to another structure or shoreline anchor; are typically hoops made of welded steel bolted or welded to the frame of a launch.

Glossary - 5

REBAR: A rod of steel placed into concrete as a reinforcement.

Glossary - 6

RIP-RAP: A foundation or retaining wall usually made of stones. Often used to prevent erosion and normally placed on or around an embankment.

STRINGERS: A series of uniform pieces of wood, aluminum, or steel used to reinforce decking on a launch structure.

Now that you are Prepared to Launch… Let's Go Paddling!

- Prepare to Launch! can be seen online, at www.river-management.org/library
- This is a joint publication between the River Management Society and the National Park Service's Rivers, Trails and Conservation Assistance Program