Detroit Lake Restoration and Enhancement Design Booklet

U.S. Forest Service
Detroit Ranger District

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Contents

1.0 Executive Summary

It is the goal of this project to develop a comprehensive set of designs for Kanes Marina, Piety Island, Detroit Flats and Santiam Flats at Detroit Lake, Oregon. The project will include both detailed schematic designs for each site as well as individual design components as they pertain to each site. These designs aim to create a stronger sense of place - one that improves upon each location's existing and unique characteristics while creating a recognizable and consistent landscape language between sites. Furthermore, these designs will create holistic places that strike a balance between local residents, tourists and environmental systems. Careful attention will be given to creating spaces that preserve and improve upon the local ecosystem while strengthening the quality and recreational capacity at all sites and scales of the project. Designs will respond to the dynamic nature of this lake by providing safe access to a series of multifaceted landscapes.

2.0 Project Schedule

Weeks	Project Tasks	Weekly Tasks	Deliverables
1 (5/23)		Develop Timeline and Initial Working Framework	
2 (5/30)	Develop Scope of work with U of O	Research and Materials Collection	Project Timeline **(Payment Period 1) Products delivered by 6/3**
3 (6/6)		Research and Materials Collection	
4 (6/13)	Consolidation of Plans generated by previous students and development of a proposal of intent for project areas	Consolidation of previous plans. Draft initial Goals and Objectives for all sites	Revised Project Timeline, Project goals and objectives, New base maps, Consolidated plans **(Payment Period 2) Products delivered by 6/17**
5 (6/20)		Design development (Master Plan) Draft 1	
6 (6/27)	Development of Scope of projects, plan for sensing Forest Service personnel, and tentative planning for sensing public. Draft initial plan for sites completed. Begin public comment process.	Design development (Detroit Flats) Draft 1	

7 (7/4)		Design development (Piety Island) Draft 1	
8 (7/11)		Design development (Santiam Flats) Draft 1	
9 (7/18)		Public process / agency commenting	
10 (7/25)	Submittal of a draft master plan incorporating public agency comments. Revised plan outline developed.	Comment consolidation	Master plan and sites Draft 1, Consolidated public comments **(Payment Period 3) Products delivered by 7/29**
11 (8/1)		Design development Draft 2	
12 (8/8)		Design development Draft 2	
13 (8/15)		Public process / agency commenting	
14 (8/22)	Further refinement of public comments and revised plan details as per Draft #2 products of Master Plan	Design development Draft 3	Master plan and sites Draft 2, Consolidated public comments **(Payment Period 4) Products delivered by 8/28**
15 (8/29)		Design development Draft 3	
16 (9/5)	Submittal of draft #3 of Master plan with detailed products to FDRCDL, and USFS and public	Design development Draft 3. Agency meeting and comments.	Master plan and sites Draft 3, Consolidated public comments **(Payment Period 5) Products delivered by 9/9**
17 (9/12)		Final Design Work	
18 (9/19)		Final Design Work	
19 (9/26)		Final Design Work	

20 (10/3)	Development of final Master plan for sites representing agency and public concerns. Plan to be presented in a 11x17 colored format bounded and finished in a booklet format.	Final Design Work	Final design booklet **(Payment Period 6) Products delivered by 10/7**

3.0 Introduction

3.1 History

For over fifty years Detroit Lake has served Oregon and the greater Pacific Northwest as the choice recreation spot for boaters and aquatic activities. The site of the lake was originally occupied by a historic railway line for the Oregon Pacific Railroad. The lake was created in the 1950's after the completion of the Detroit Lake Dam. Although the dam was intended to provide hydroelectric power and flood control protection it quickly created Oregon's busiest recreational lake.

3.2 Current Conditions

Today the lake services nearly 500,000 people a year hitting peak tourist times in the summer months when the reservoir is filled to near capacity. High reservoir heights (super-filling) and high recreation use on the lake have degraded both ecological systems and recreational facilities. Shoreline stabilization is needed at all sites as are new recreational opportunities (see 6.1, 7.1, 8.1, 9.1). Current reservoir levels are Full Pool (Normal Pool) = 1563.5 feet, Superfill = 1565.5 feet.

3.3 Opportunities and Constraints

Due to the lake's dynamic nature and fluctuating water heights all designs must respond to a complex set of landscapes and site-specific requirements. It is important to consider the stark nature between summer and winter landscapes as a result of these differing water heights and to seek to create places that can accommodate recreational activities at all times of the year. Furthermore, so as to protect these sites, major infrastructure investments or toilets must be designed and in stalled above the 1569' (Full Pool) elevation. Trails, picnic tables, benches, etc. can be designed to 1567.5 (or two feet above "superfill") to be relatively safe with rare and short term flood events.

All designs must be able to accommodate increased public use including recreational opportunities, access, parking, etc. and meet the goals and objectives of the following: West Cascades National Scenic Byway Corridor Plan; Detroit Lake Composite Management Guide; The Build Environment Image Guide For National forest and Grasslands; Universal Access Outdoor Recreation: A Design Guide; Canyon Journey Trails Feasibility Study; Detroit Transportation System Plan.

Natural landscape systems must be considered in all designs and the utmost care taken to preserve and restore these systems. As many recreational activates on the lake rely on human interactions with plant and animal species it is important that these systems and places be made

simultaneously sustainable and accessible.

4.0 Previous Work

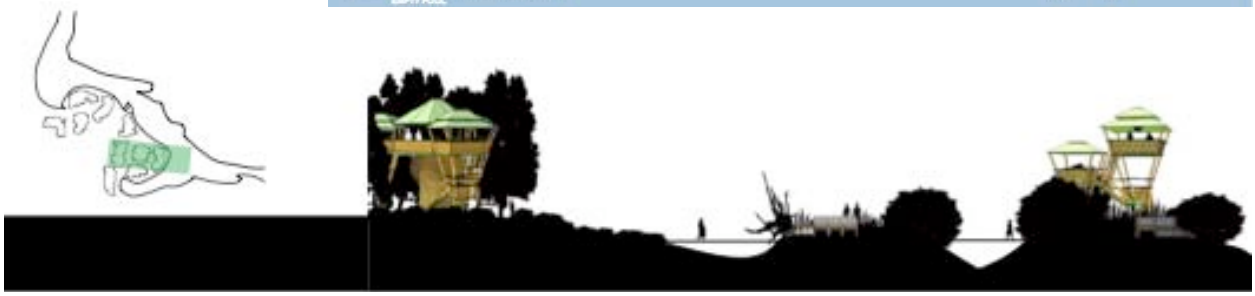
4.1 Introduction

In the winter of 2010 The University of Oregon's Landscape Architecture department developed a series of schematic designs for the three sites covered in this booklet. These designs addressed many of the aforementioned issues listed in section 3 of this booklet. The following section reviews key design elements developed by these students for all sites.

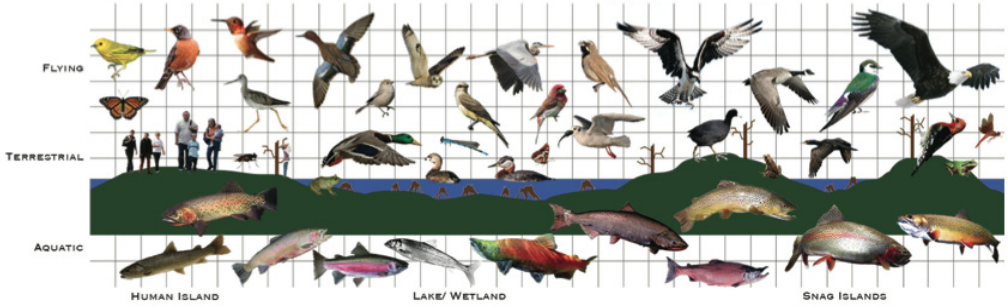
4.2 Detroit Flats

Design By:
Ashley Boand

Ashley's design incorporates a multiuse recreational area at the heart of Detroit that responds to many of the ecological concerns of the area. Furthermore, her design artfully creates spaces where humans and nature coexist harmoniously. New bird watching towers, islands and habitat spaces are accompanied by pedestrian paths, recreational spaces and day use activities.



Design By:
Olivia Waller

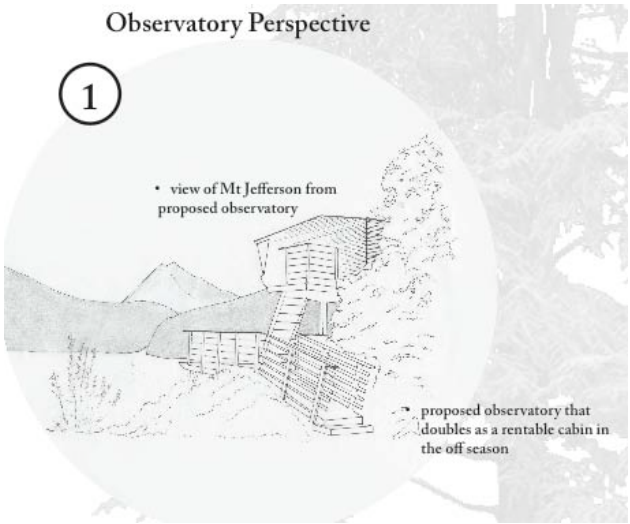


Olivia's design for Detroit Flats utilized a graphic chart of animal interactions aimed at demonstrating the desired conditions of the site. This interaction between avian, terrestrial and aquatic species is a key component to the successful design of this area.

4.3 Piety Island

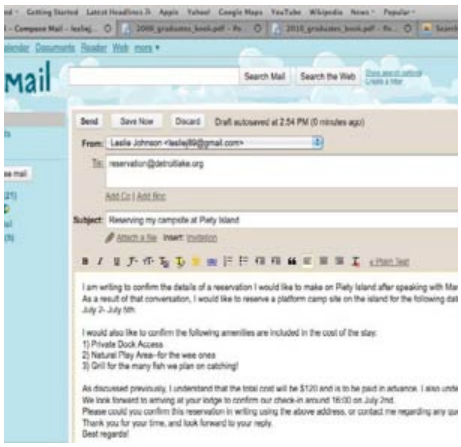
Design By:
Andria Truax

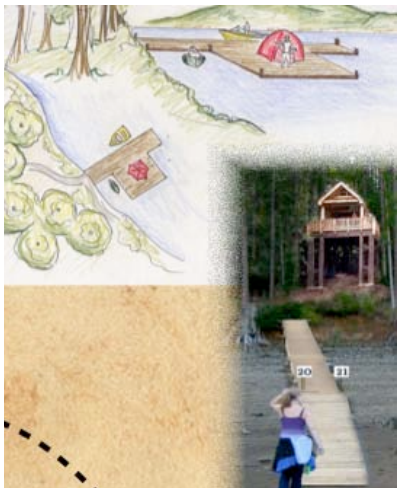
Andria's design for Piety Island was aimed at creating functional and aesthetically appropriate recreational structures throughout the island. Specifically, her design called for the dredging of the lagoon on the East side of the island so as to promote boat access. This area also saw the inclusion of a boat dock, shoreline stabilization and numerous campsite improvements including viewing structures and for-rent elevated cabins. Her aesthetic treatment for the site is consistent with Cascadian style design and desired Forest Service design requirements.



Design By:
Leslie Johnson

Leslie's design begins in the digital realm where visitors and tourists to the area can learn about the various amenities and experiences that Detroit Lake offers. After looking at and booking a site or activity visitors can find themselves transported into nature. The Island itself is replete with a new trail system, tent platforms for camping and natural play and exploration areas.





4.4 Santiam Flats

Design By:
Audrey McLaughlin

Audrey's design for Santiam Flats explored the creation of a more naturalistic camping experience. With better ties to the water and an improved ecological zone through the use of micro topographic islands, this design created a holistic place for humans and animals. The inclusion of covered shelters, boardwalk paths and yurts has significantly improved upon the status of the existing campground.

Design By:
Jacob Kucharski

Key elements from Jacob's design were access to water and shoreline stabilization. By using terraced banks and gabions to stabilize the eroding shoreline, this design was able to solve many site problems with a low cost solution. However, the aesthetics of this design type are not consistent with Cascadian style construction and should be reworked to better achieve a functioning aesthetic. In place of gabions and concrete terracing, bioremediation and bio-engineering is more appropriate for this project.

5.0 Goals

- Create and improve recreation opportunities and experiences and create universal access for people with disabilities.

- Stabilize and restore the eroding shoreline to reduce erosion and protect private property, recre ation facilities and habitat.

- Minimize disturbance to private home owners; provide public safety and security adjacent private property.

- Expand season of use for recreation opportunities that promotes local tourism.

- Incorporate low maintenance facilities and landscaping; use materials that require lower annual maintenance and replacement intervals, use amenity and facility layouts that consider operational and maintenance efficiency.

- Establish a consistent landscape language between all project sites that responds to the Detroit Lake vernacular and creates a strong sense of place. This language will also utilize the constructs outlined in the: West Cascades National Scenic Byway Corridor Plan; Detroit Lake Composite Management Guide; The Build Environment Image Guide For National forest and Grasslands; Universal Access Outdoor Recreation: A Design Guide; Canyon Journey Trails Feasibility Study; Detroit Transportation System Plan

- Preserve and restore the existing ecology and natural systems in the Detroit Lake area

6.0 Kanes Marina

6.1 Analysis of Current Conditions

Currently, Kanes Marina serves as one of the main recreation areas in the Detroit Lake area. With a day use area and boat access, via privately owned docks, this site sees a large number of visitors every year. The existing parking lot and facilities at this site cannot accommodate these numbers and needs significant improvements. In addition to the degraded recreational infrastructure, the site can accommodate more recreational opportunities—especially where water access is concerned. The trail and trail head that connects users to the Detroit Flats area is degraded, does not meet ADA specifications and needs improvements to ensure stabilization and longevity. The shoreline in this area is also severely eroded in specific locations and needs to be stabilized with reinforcements.

6.2 Opportunities and Constraints

The current owner of the marina is seeking to remove approximately 80,000 cubic yards of soil in the area directly below the marina so as to extend the boating season. The spoils of this excavation can be used at both Kanes Marina (see pg. 24) and Detroit Flats (see pg. 46) in the creation of new islands and piers.

Local residents in the area, especially those directly adjacent to the shoreline and path systems have legitimate concerns about safety, privacy and the preservation of their private property. It is important to maintain a degree of separation between these two uses and to ensure that these properties are not adversely affected by any changes that may take place in the course of this design and implementation.

6.3 Objectives

- Create a universally accessible trail and trail head at Kanes Marina.
- Stabilize the eroding shoreline.
- Create new recreational opportunities.
  (fishing piers, water access and seating/picnic areas)
- Improve upon the existing recreational infrastructure.
- Protect fish and wildlife species.
- Create more distinction between public and private properties.

6.4 Design (See Fold-out)

The redesign of Kanes Marina seeks to add to and improve upon the existing recreational infrastructure at the site, stabilize the shoreline, protect local residences and improve the current ecological systems. Specifically, the design proposes the redesign of the day use area and trail head directly south/southwest of the marina building.

The improvement of the day use area includes the addition of more seating (Pg. 14), emergency boat access (Pg. 30), new toilets (Pg. 14) and improved, universal, water access (Pg. 30).

Improvements to the trail head include new signage (Pg. 28), a universal access ramp (Pg. 16), gateway to the path system (Pg. 16) and improved trail system (Pg. 18). This new trail system will utilize new paving (Pg. 18) and will connect to the Detroit Flats area via a bridge (Pg. 66).

New vegetative screening and the repositioning of the trail system (Pg. 22) will help protect private property while providing users with a safe and accessible route to new recreational opportunities (Pg. 26).

Shoreline stabilization (Pg. 20) will help protect the eroding shoreline and improve accessibility throughout the site.

New fishing piers and universal water access (Pg. 26) will provide users with new recreational opportunities and will help to protect the marina by attenuating wave action from boaters (Pg. 26).

Invasive plants will be removed from the site and replaced with native vegetation so as to improve animal habitat (Pg. 60).

6.5 Design Components

The following section explores specific design components in greater detail as they relate to the Kanes Marina area and design. These components are intended to address the primary problems and concerns at this site and may suggest more than one option or solution.

6.5.1 Design Component - Facilities and Amenities

Current Conditions:

Facilities at Kanes Marina are limited in both number and quality. Serious improvements are needed to accommodate for both an increased number of users as well as to meet an improved landscape vernacular. Restrooms consist of a number of port-a-potties which are owned and maintained by a private company. These restrooms are unsightly and are not imagable in any regard. Trash receptacles and on-site recycling are limited and hard to find and are often full or overflowing from excessive use. Seating consists only of picnic benches which are generally in high use.

Fig. 6.5.1 - A; Kanes Marina Existing Rest Rooms

Recommendations:

The design recommends the installment of two new restroom facilities on-site to replace the current port-a-potties. CXT Cascadian vault toilets (currently used at Piety Island) are one option, however, another option could include connecting directly to the city of Detroit's municipal water system. These restrooms must have a 100 foot setback from the water and should sit above the 1569 foot contour.

These restrooms should be placed adjacent to the primary day use area at Kanes Marina (Fg. 6.5.1 - A), but at an ample distance from the restaurant to keep septic odors at bay, and should meet the specifications and requirements as outlined in the West Cascades National Scenic Byway Corridor Plan; Detroit Lake Composite Management Guide; The Built Environment Image Guide For National forest and Grasslands; Universal Access Outdoor Recreation: A Design Guide.

New garbage and recycling areas have also been included in the design so as to accommodate for increased use. These areas are located throughout the site. These receptacles should be constructed from durable materials (concrete, metal or plastic) and should aim to match the image requirements outlined in The Built Environment Image Guide For National forest and Grasslands. One option could include containing these receptacles within a wooden enclosure to achieve a better aesthetic.

New seating has been included in this design so as to accommodate a greater demand. These seats have been placed around the site and can consist of wooden picnic tables like those currently found on site, however, single bench seating is also desirable in select locations. These new seats should be constructed from durable materials (wood or composite) and should aim to match the image requirements outlined in The Built Environment Image Guide For National forest and Grasslands.

Fig. 6.5.1 - B; Kanes Marina Proposed Rest Rooms

Fig. 6.5.1 - C, Proposed Recycling Area

6.5.2 Design Component - Trailhead

Current Conditions:

The trailhead at Kanes Marina is generally undefined and unrecognizable as a trail head. There is great need for definition of the beginnings of this trail. There is also considerable need for an area map located at or near the trail head to inform visitors of the trail routes within the context of the environment.

There is much room for improvement of this trail heads, including ADA accessibility, as it is currently inaccessible by individuals with physical disabilities.

Fig. 6.5.2 - A; Kanes Marina Existing Trailhead

Recommendations:

A trail head sign and area map is recommended. Trail destinations, distances and walking times should be included in signage information.

Trash and recycling receptacles should be installed at or near the trail head to reduce litter on the trail and bring visitors awareness to maintenance efforts.

Fig. 6.5.3 - B; Kanes Marina Proposed Trailhead

6.5.3 Design Component - Trails

Current Conditions:

There is currently no continuous trail linking Kanes Marina and the Day Use Area at the Southeast end of Detroit Flats. A partial trail beginning at Kanes Marina follows the shoreline, then ends abruptly within a few hundred yards. The existing trail is rustic and does not accommodate visitors with physical disabilities, such as individuals in wheelchairs or those using walkers.
There is currently no designated resting place along the trail, such as benches or covered areas.

Fig. 6.5.3 - A; Kanes Marina Existing Trailhead

Fig. 6.5.3 - B; Kanes Marina Existing Trail

Recommendations:

There are different user groups that will need different types of paths, including paved paths, rustic campground paths, hiking and adventure trails. All trails within the Detroit Flats Area are to be clearly marked with trailhead signs and directional signs at intersections.

Paved paths should be installed to accommodate elderly people and people with physical disabilities. These will need to be ADA accessible pathways, must be paved with asphalt, concrete, wood planks, or other acceptable materials, and must meet all ADA accessibility guidelines (ADAAG).

The existing path, beginning at Kanes Marina will extend along the shoreline briefly. Along this section there are two proposed fishing piers. Beyond the fishing piers, the trail traverses a bridge and continues toward the Day Use Area along a series of islands.

Kanes Marina has a number of areas where the existing path sits atop the eroded shoreline with a sizeable drop off the edge. New paths can be incorporated into the shoreline stabilization projects in certain areas, which would strengthen the design and increase safety in these areas.

Fig. 6.5.3 - C; Kanes Marina Existing Trail

Fig. 6.5.3 - D; Kanes Marina Proposed Trail

6.5.4 Design Component - Shoreline Stabilization

Current Conditions:

Shoreline stabilization is particularly important at Kanes Marina. There is an extreme amount of wave action at this location from northeast bound wind waves and a concentration of boat wake waves. Erosion is progressing rapidly.

As the water level in Detroit Lake rises and falls annually in response to flood control needs, which are based on seasonal runoff volumes, the soil horizon of the steep canyon slopes quickly erodes away. The mixed-conifer and broad-leaf deciduous forest environment surrounding the lake thrives in soft well-drained sedimentary soils. These soil types do not hold up to erosional forces of lake waves, therefore soil stabilization is needed.

Erosion processes are a natural part of the hydrologic cycle and provide essential habitat for plants, fish and wildlife as well as ecosystem services such as water filtration and soil formation. Erosion of Detroit Lake's 32 miles of shoreline however is arguably unnatural, as it is a product of the man-made Detroit Dam, built in 1953 to control flooding.

Erosion is most extreme at elevations near the normal pool water level of 1,563 feet above sea level during the summer season when strong wind waves and boat wakes breakdown the softer sedimentary layers of the steep banks. For six months of the year, from mid-April until mid-September, the water level is typically between 1,554 feet and 1,566 feet (though levels could be as low as 1,542 feet during the popular boating season in years of drought). This section of the shoreline is in critical need of stabilization because it undergoes the most damage in a very short period of time (fig.6.5.4-A,B).

Fig. 6.5.4 - A,B; Kanes Marina Existing Shoreline

Recommendations:

As a hub of activity, Kanes Marina supports many different types of recreation including motorized boating, kayaking, fishing, hiking, swimming, bird watching and dining. This variety of activities demands a variety of different shoreline stabilization treatments. Within the emergency boat launch area, where heavy trucks with trailers need access to the water's edge, a traditional type of structural stabilization is appropriate (fig.6.5.4 - C,D). Where lighter foot traffic is the primary mode of access, a non-structural, or biotechnical approach is recommended (fig. 6.5.4 - E,F).

Fig. 6.5.4 - C-D; Kanes Marina Shoreline Recommendations, Structural

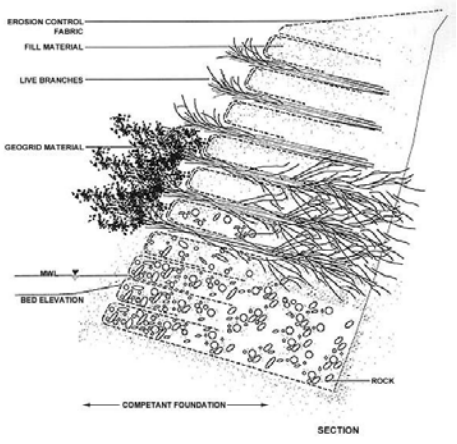


Fig. 6.5.4 - E,F; Kanes Marina Shoreline Recommendations, Biotechnical

6.5.5 Design Component - Private/Public Property

Current Conditions:

Land along the shoreline is owned by the Army Corps. of Engineers and managed by the Willamette National Forest, Detroit Ranger Station. There are private properties adjacent to this public land, some less than one hundred feet from the high water level. As the shoreline erodes away, this buffer of walkable land between lake water and private property lines gets smaller and smaller.

Many private land owners have expressed concern for privacy and safety, stating that theft and other criminal activity is a problem due to the close proximity of lake visitors to their land and homes.

Possible solutions to the problem of trespassing include physical barriers such as fences or walls along property lines, visual barriers such as vegetative screening, or greater distance between designated walking paths and private property.

Fig. 6.5.5 - A; Kanes Marina Property Edge

Recommendations:

One suggested solution is to create a vegetative buffer between paths and homes along the lake front. This proposal has met great opposition, as homeowners are equally protective of their views of the public land as they are of their own property.

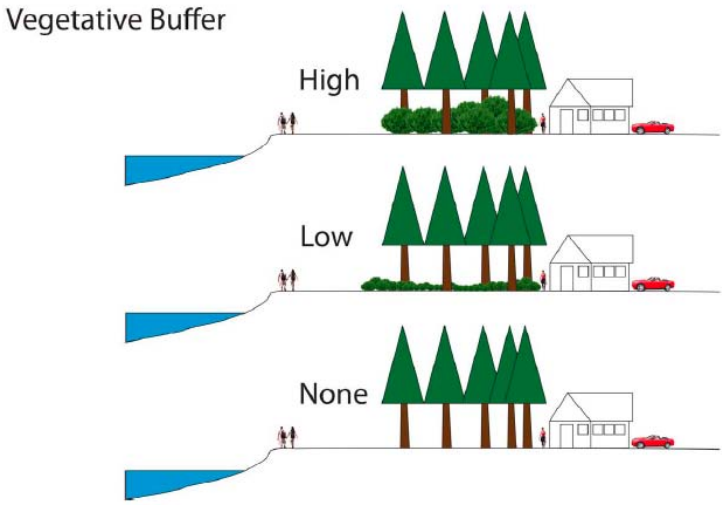


Fig. 6.5.5 - B; Vegetative Buffer

A much more popular solution among residents to the problem of the close proximity of visitors to private property is a trail system that brings the public further away from private property. This trail system requires some building up of the land within the reservoir in order to create areas high enough to stay dry all year and support permanent ADA accessible trails. This solution aims to reduce the fear of criminal activity and public disturbances at homes or private property by distancing visitors from these areas.

Fig. 6.5.5 - C; Kanes Marina Water Buffer

6.5.6 Design Component - Soil Excavation and Spoils

Current Conditions:

The current owner of Kanes Marina, is looking to remove 80,000 cubic yards of soil beneath the marina in an attempt to extend the boating season and increase boating accessibility. At this time, there are no plans regarding the relocation of the spoils from this project, however, the owner has expressed an interest in relocating this soil to a spot in the immediate vicinity in an attempt to keep the costs of this project at a minimum.

Fig. 6.5.6 - A; Kanes Marina (area to be dredged)

Recommendations:

It is the recommendation of the design to relocate the spoils from this project to the proposed island areas as designated in the new design of the Detroit Flats area. As this soil is already from the lake bottom it will ecologically and geologically match – using this soil will also not affect the storage capacity of the lake.

A partnership between the marina and the forest service already exists (through a special land use authorization), however, a new and equitable partnership between the Forest Service and Kanes Marina should be explored for the removal and relocation of this soil. This partnership and relocation of soil will help to reduce costs in the creation of new islands.

The soil height in the creation of these new islands should not exceed a height of 1567.5 (see Pg. 46) and should be planted immediately after being placed.

Fig. 6.5.6 - B; Detroit Flats (area to be filled)

6.5.7 Design Component - Fishing Piers

Current Conditions:

There is a current demand in the Detroit Lake area for more fishing areas and ADA accessible fishing platforms. Although attempts have been made in other areas there is still a demand for more accessible fishing areas – especially in the Kanes Marina and Detroit Flats area. Fishing piers should be placed in easily accessible locations that are visible from a distance to promote use and interest.

Fig. 6.5.7 - A; Kanes Marina Existing Beach/Fishing Area

Recommendations:

In an effort to meet these demands a number of fishing piers have been included in the redesign of the Kanes Marina area. These fishing piers should be constructed of wood and will be similar in style to the one at Hoover Campground.

Most likely, new soil will be needed to help keep these structures in place, however, this soil can come from any number of the proposed dredging projects at Kanes, Piety Island or Detroit Flats.

The length of these piers still needs to be determined and will be based in part on the existing topography at the sites.

Fig. 6.5.7 - B; Kanes Marina Proposed Beach/Fishing Area

6.5.8 Design Component - Signage

Current Conditions:

Signage is lacking greatly here. There is very little signage to direct visitors to places and very little signage to identify places. Kanes Marina has a few business signs. There are numerous “No Trespassing” signs near property lines.

In general, signage is greatly needed here for way finding and imageability.

Fig. 6.5.8 - A, B; Kanes Marina Existing Signage

Recommendations:

Directional signage guiding visitors to and through the parking, loading and day use area is necessary here. A large map of the lake area with key places to visit is needed to inform visitors of recreational opportunities in the area. Other key signs to be included here are: trail head signs, directional signs with distances and times of walking routes, signs along motor vehicle routes directing drivers to parking areas, docks, and amenities.

Directional signs specific to pedestrian traffic include restroom signs, garbage/recycling facilities signs, fishing docks, ADA accessible routes, bike route signs, picnic tables, swimming areas, interpretive signs for natural processes, and restaurants or other business establishments.

Identity signage is also necessary to increase the imageability of Kanes Marina. A gateway, welcome or threshold sign letting visitors know they have arrived is critical to the imageability of the area.

Fig. 6.5.8 - C-F; Kanes Marina Proposed Signage

6.5.9 Design Component - Boat/Water Access

Current Conditions:

Access to and from the water is limited in the Kanes Marina project area. Although the land is public, problems with local private property owners has continued to reduce ingress egress. The eroded shoreline also makes this accessibility more difficult as do the limited number of paths to and from the water. Fluctuating water heights throughout the year add yet another component to the problems of accessibility.

Fig. 6.5.9 - A; Kanes Marina Eroding Shoreline

Fig. 6.5.9 - B; Kanes Marina Existing Service Boat Launch

Recommendations:

Improvements to water accessibility begin with the rebuilding and stabilization of the shoreline in all eroded places. This stabilization will help to create a more gentle slope to the waters edge in the bioengineered areas or, conversely it will step down to the water in areas that require a more serious treatment of gabions and riprap.

An improved, universally accessible, trail system (Fig. 6.5.9 - C) will also help better connect users with the water as will a new switchback ramp which will allow easy access to the waters edge for disabled users. This system, constructed from concrete, will allow accessibility year round regardless of the height of the water and could also be used as a place for non-motorized boats (kayaks, etc.) to launch.

Unlike other sites, the Kanes Marina site will not provide boaters with an area for tie-ups.

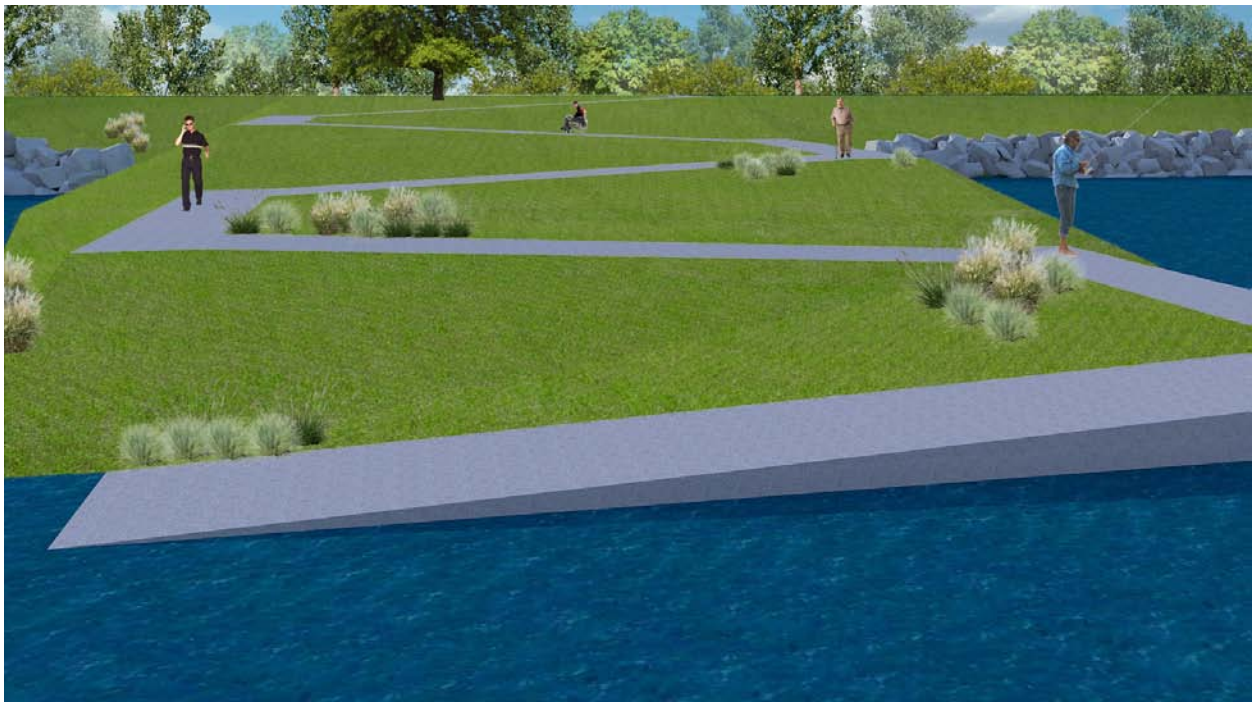


Fig. 6.5.9 - C; Universally Accessible Shoreline Access

7.0 Detroit Flats

7.1 Analysis of Current Conditions

Detroit Flats is located in downtown Detroit, directly adjacent to the lake and across from Piety Island. The Flats were historically an undeveloped space that in the early 90's was converted to a day use area. Picnic tables, toilets, information boards and other amenities were installed at this time. Access to this area is limited despite shoreline access via Kanes Marina and a number of public right of ways and currently shares a road with a number of private residences. Ecologically, the site is excellent habitat for aquatic and avian species, including migratory song birds—a key and unique component of this site and within the Cascades, with over 100 species documented (see Appendix B). Such attractions draws a large number of tourists every year. The utmost care should be taken to preserve this habitat and improve upon it.

Extensive shoreline erosion is evident on the peninsula and restorative efforts could be incorporated into any ecological restoration. Due to its centralized location Detroit Flats is an excellent site for a large intervention. Varying water heights during the year reveal or hide a stump-ridden connection to Piety Island which increases the shoreline by a considerable amount.

7.2 Opportunities and Constraints

The existing, and extremely high, topography in the Detroit Flats bay allows for the easy creation of islands which can create new habitat spaces as well as new recreation spots. Soil from the Kanes Marina dredging project, as well as soils from the Piety Island channel project could be dumped in these locations to create a number of these islands.

Stumps in this area must be preserved where possible for habitat. Where stumps are removed they should be saved and placed in strategic shoreline locations for habitat and shoreline stabilization.

Aquatic and avian habitat in this area is exceptionally strong and should be maintained and improved upon to the best ability possible.

Local residents in the area, especially those directly adjacent to the shoreline and path systems have legitimate concerns about safety and the preservation of their private property. It is important to maintain a degree of separation between these two uses and to ensure that these properties are not adversely affected by any changes that may take place in the course of this design and implementation.

7.3 Objectives

- Increase access to the site through improved signage, entrances and transportation routes
- Establish and maintain vehicle access to Piety Island during winter months
- Stabilize the shoreline where needed and incorporate water access at these places
- Provide new fishing, aquatic and recreational opportunities
- Protect and improve ecological systems and habitat for animal life
- Create an attraction for local residents and tourists
- Increase appreciation and knowledge of Detroit Flats aquatic ecosystems and history of the surrounding area through interpretation.

7.4 Design (See Fold-out)

The redesign of the Detroit Flats recreation area seeks to improve upon the sites existing features so as to strengthen the recreational value as well as improve upon the ecological conditions.

Included in the design is the addition of new toilets (Pg. 36), new garbage and recycling areas (Pg. 36), new and improved, universal, water access (Pg. 50, 62) and new boat access (Pg. 54).

The trail system has been paved throughout the site so as to accommodate for universal access and more use (Pg. 40). New bridges help connect people through the site (Pg. 66), while new vegetation protects private property and helps preserve views (Pg. 44).

The creation of a number of new islands (Pg. 46) help create new habitat spaces as well as new spaces for recreation and bird watching. In addition to this, new bird watching platforms (Pg. 56) assist in viewing opportunities.

Invasive plant species have been removed and replaced with native plant species with an emphasis on providing rich habitat for aquatic and avian animal species (Pg. 60).

New roads in and out of the site (Pg. 58), as well as new parking lots (Pg. 48) help provide better access to the site. In addition to these, an improved day use area on the Southeast side of the site helps to better connect people with the water as well as provide safe recreational opportunities (Pg. 62) .

Shoreline stabilization (Pg. 42), especially on the South side of the site will help protect the eroding shoreline while providing new habitat spaces.

7.5 Design Components

The following section explores specific design components in greater detail as they relate to the Detroit Flats area and design. These components are intended to address the primary problems and concerns at this site and may suggest more than one option or solution.

7.5.1 Design Component - Facilities and Amenities

Current Conditions:

The facilities at Detroit Flats are limited in both number and quality and need serious improvements to accommodate for both an increased number of users as well as to meet an improved landscape vernacular. Restrooms on site consist of a number of port-a-potties which are owned and maintained by a private company. These restrooms are unsightly and are not imagable in any regard. On-site trash receptacles are limited and hard to find and are often full or overflowing from increased use and recycling receptacles of any kind do not exist. Seating consists of scattered picnic benches which cannot accommodate the high numbers of users found at peak times of the year. Similarly, charcoal grill stations on-site are also limited and cannot accommodate the high numbers of users found at peak times of the year. These stations could be improved and linked with the city water systems new line located at Detroit Flats Road to facilitate easier maintenance and meet new aesthetic requirements.

Fig. 7.5.1 - A-D; Detroit Flats Existing Facilities and Amenities

Recommendations:

The design recommends the installment of a number of new restroom facilities on site to replace the current port-a-potties. CXT Cascadian vault toilets (currently used at Piety Island) are one option, however, another option could include connecting directly to the city of Detroit's municipal water system. These restrooms must have a 100 foot setback from the water and should sit above the 1569 foot contour.

These restrooms should be placed directly adjacent to the primary day use area at Detroit Flats as well as the new parking area just Northwest of this area. These restrooms should meet the specifications and requirements as outlined in the West Cascades National Scenic Byway Corridor Plan; Detroit Lake Composite Management Guide; The Built Environment Image Guide For National forest and Grasslands; Universal Access Outdoor Recreation: A Design Guide.

New garbage and recycling areas have also been included in the design so as to accommodate for increased use. These areas are located throughout the site and should be constructed from durable materials (concrete, metal or plastic) and should aim to match the image requirements outlined in The Built Environment Image Guide For National forest and Grasslands. One option could include containing these receptacles within a wooden enclosure to achieve a better aesthetic.

New seating has been included in this design so as to accommodate a greater demand. These seats have been placed around the site and should consist of wooden picnic tables like those currently found on site, however, single bench seating is also desirable in select locations. These new seats should be constructed from durable materials (wood) and should aim to match the image requirements outlined in The Built Environment Image Guide For National forest and Grasslands.

The design also recommends replacing the current, outdated, grill stations found on site with new grills of the same type.

7.5.2 Design Component - Trailheads

Current Conditions:

Trailheads in the Detroit Flats area are generally undefined and unrecognizable as trail heads. There is great need for definition of the beginnings of trails. There is also considerable need for an area map located at or near such trail heads to inform visitors of the trail routes within the context of the wetland environment.

Visitors are forced to hunt for the trail under existing conditions. There is much room for improvement of these trail heads.

Fig. 7.5.2 - A; Detroit Flats Existing Trailhead Signage

Fig. 7.5.2 - B; Detroit Flats Existing Trailhead Parking

Recommendations:

Trailhead signs and area maps are recommended. Trail destinations, distances and walking times should be included in signage information.

Trash and recycling receptacles should be installed at or near the trail head to reduce litter on the trail and bring visitors awareness to maintenance efforts.

Fig. 7.5.2 - C-F; Detroit Flats Trailhead Recommendations

7.5.3 Design Component - Trails

Current Conditions:

There is currently no continuous trail linking Kanes Marina and the Day Use Area at the Southeast end of Detroit Flats. A partial trail beginning at Kanes Marina follows the shoreline, then ends abruptly within a few hundred yards. Another trail begins at the Day Use Area and ends at the tip of Osprey Point when lake levels are high. When lake levels are lower and the land bridge between Osprey Point and Piety Island is above the water level, then there exists a trail that visitors can travel to reach Piety Island. Existing trails are rustic and do not accommodate visitors physical with disabilities such as individuals in wheelchairs or those using walkers.
There are currently no designated resting places along the trails, such as benches or covered areas.

Fig. 7.5.3 - A-C; Detroit Flats Existing Trails

Recommendations:

There are different user groups that will need different types of paths, including paved paths, rustic campground paths, hiking and adventure trails. All trails within the Detroit Flats Area are to be clearly marked with trail head signs and directional signs at intersections.

Paved paths should be installed to accommodate elderly people and people with physical disabilities. These will need to be ADA accessible pathways, must be paved with asphalt, concrete, wood planks, or other acceptable materials, and must meet all ADA accessibility guidelines (ADAAG).

Fishing and viewing will occur along the trails. Trails should meander as they near the waters edge. Trails will also need to be widened at particular points of interests to accommodate for where people are likely to gather for fishing, bird watching, setting up coolers, chairs, etc.

Fig. 7.5.3 - D-G; Detroit Flats Trail Recommendations

7.5.4 Design Component - Shoreline Stabilization

Current Conditions:

As the water level in Detroit Lake rises and falls annually in response to flood control needs, which are based on seasonal runoff volumes, the soil horizon of the steep canyon slopes quickly erodes away. The mixed-conifer and broad-leaf deciduous forest environment surrounding the lake thrives in soft well-drained sedimentary soils. These soil types do not hold up to erosional forces of lake waves, therefore soil stabilization is needed.

Erosion processes are a natural part of the hydrologic cycle and provide essential habitat for plants, fish and wildlife as well as ecosystem services such as water filtration and soil formation. Erosion of Detroit Lake's 32 miles of shoreline however is arguably unnatural, as it is a product of the man-made Detroit Dam, built in 1953 to control flooding.

Erosion is most extreme at elevations near the normal pool water level of 1'563.5 feet during the summer season when strong wind waves and boat wakes breakdown the softer sedimentary layers of the steep banks. For six months of the year, from mid-April until mid-September, the water level is typically between 1,554 feet and 1564 feet. This section of the shoreline is in critical need of stabilization.
Bank stabilization is particularly important at locations along the shoreline within the three specified areas of this project, Detroit Flats (including Kanes Marina), Piety Island, and Santiam Flats.

Fig. 7.5.4 - A,B; Detroit Flats Existing Shoreline Erosion

Recommendations:

There are four general approaches to shoreline stabilization.
1. Non-structural
2. Structural
3. Bioengineering
4. Biotechnical

Non-structural options include land use management and planning, public education, and re-vegetation with native species. These types of efforts could potentially incorporate participation of youth corps work crews, local volunteers, citizens and concerned homeowners.

Structural options include revetments, stone riprap, gabion mattress, seawalls, concrete walls, gabion walls, bulkheads (sheet piles, steel/timber cribbing), groins, and breakwaters. The cost of these methods is typically more expensive than that of other methods. Materials for these structures must travel long distances, increasing construction costs considerably.

Bioengineering options include live staking, contour wattling, brush layering, and brush matting. While it is true that a streambank's primary role is to confine stream flow, there is a strong biological value related to "edge effect" and biodiversity. The transition area between water bodies (streams, rivers, and lakes) and upland areas is called the riparian zone, and it represents some of our most valuable and diverse fish and wildlife habitats. The outdoorsman knows this is where he can find a brook trout lying under a root waiting for a caddis fly to drift by, where red foxes hunt mice, where muskrat and beaver build their lodges, where deer and frogs feed, and where turtles sun themselves. Accelerated erosion of streambanks can degrade these habitats, and some types of streambank protection such as concrete retaining walls and riprap can destroy this critical habitat. –Robbin Sotir Biotechnical and Soil Bioengineering Slope Stabilization.

Biotechnical options include erosion control matting, vegetated riprap (joint planting), vegetated gabion walls, vegetated gabion mattresses, and vegetated cribbing or live cribbing. Live cribbing includes use of large logs with or without root wads.
These methods could incorporate local materials such as rock, native riparian plants, and wood debris collected on Detroit Lake during the annual Lake Sweep.

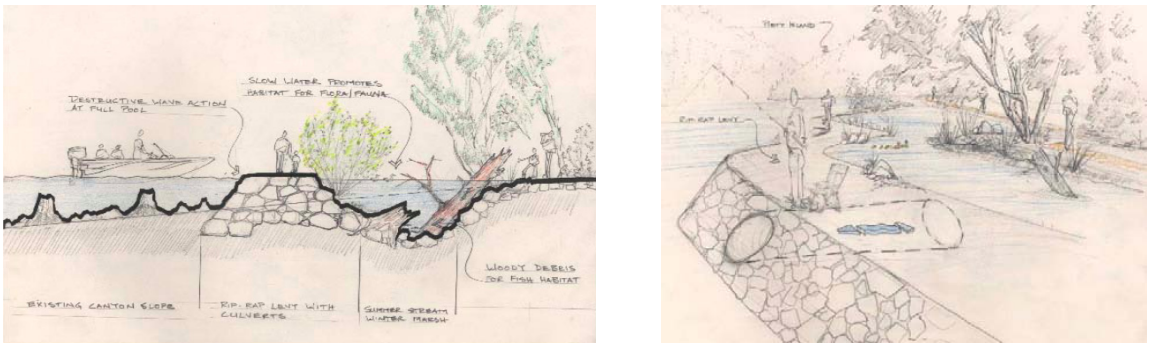


Fig. 7.5.4 - C,D; Detroit Flats Proposed Shoreline Stabilization

7.5.5 Design Component - Private/Public Property

Current Conditions:

Land along the shoreline is owned by the Army Corps. of Engineers and managed by the USFS Detroit Ranger Station. There are private properties adjacent to this public land, some less than one hundred feet from the high water level. As the shoreline erodes away, this buffer of walkable land between lake water and private property lines gets smaller and smaller.

Many private land owners have expressed concern for privacy and safety, stating that theft and other criminal activity is a problem due to the close proximity of lake visitors to their land and homes.

Possible solutions to the problem of trespassing include physical barriers such as fences or walls along property lines, visual barriers such as vegetative screening, or greater distance between designated walking paths and private property.

Fig. 7.5.5 - A; Detroit Flats Existing Private/Public Property

Recommendations:

As with Kanes Marina, one suggested solution is to create a vegetative buffer between paths and homes along the lake front. This proposal has met great opposition, as homeowners are equally protective of their views of the public land as they are of their own property.

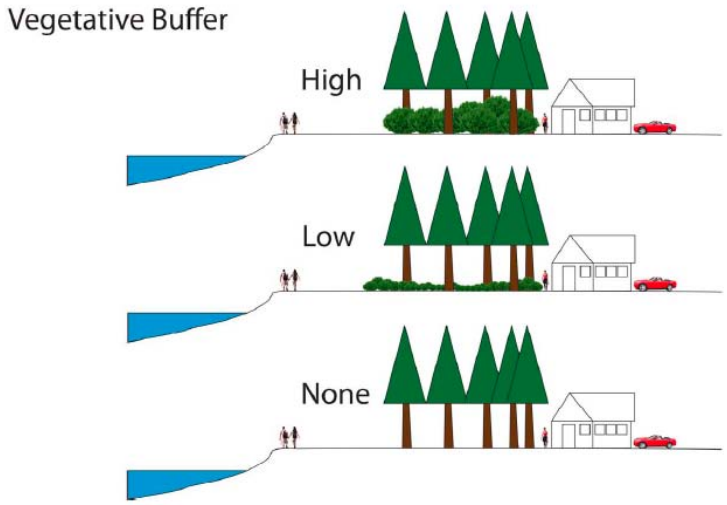


Fig. 7.5.5 - B; Detroit Flats Private/Public Property Options

A much more popular solution to the problem of the close proximity of visitors to private property among residents of the Detroit Flats area, as well as of residents near Kanes Marina, is a trail system that brings the public further away from private property. This trail system requires some building up of the land within the reservoir in order to create areas high enough to stay dry all year and support permanent ADA accessible trails. This solution aims to reduce the fear of criminal activity and public disturbances at homes or private property by distancing visitors from these areas.

Fig. 7.5.5 - C; Detroit Flats Private/Public Property Recommendation

7.5.6 Design Component - Islands

Current Conditions:

Currently the Detroit Flats area has a number of islands that emerge from the lake based on the fluctuating water heights. These islands, while not formally defined, are an important part of the topography in this area. These high spots in the water are dangerous for boaters and should be addressed as such. Furthermore these high spots provide excellent fishing areas for osprey and eagles.

Fig. 7.5.6 - A,B; Detroit Flats Islands Existing Conditions

Recommendations:

The design recommends formalizing these islands to create a consistent chain of recognizable islands. These islands should be an average height of 1569' and should follow the placement and size as shown on the design. The placement of these islands is based on the existing high topographic areas which should make them easy to define.

Soil can be used from the Kanes Marina excavation project or from the channel-widening project scheduled for Autumn of 2011. This soil should be mounded in the designated locations and planted (See appendix) and armored (See Pg. 42) as quickly as possible to prevent erosion.

Removed tree stumps should be replaced on the shoreline of these islands to promote habitat and help contain the soil. Plants should be selected based on their height, resilience and adaptability. Plants should not grow above 10' as they will obstruct onshore views to the lake and island.

Fig. 7.5.6 - C; Detroit Flats Islands Proposed Plan

7.5.7 Design Component - Parking

Current Conditions:

Currently the parking at Detroit Flats is limited and poorly laid out. With a high number of visitors every year, especially during peak times in the summer months, this parking lot is not equipped to meet the demand. The existing compacted gravel creates dust and requires yearly maintenance. Furthermore, this gravel severely diminished the accessibility for the site – especially for people with disabilities.

A large planted area in the middle of the parking area occupies a large portion of the site and is not being used to its best and highest use. The parking area is aesthetically deficient and could use serious improvements.

Fig. 7.5.7 - A,B; Detroit Flats Parking Existing Conditions

Recommendations:

In an effort to maximize space and provide more parking in the Detroit Flats area the design recommends the installation of a new parking lot in approximately the same location as the existing one. This parking lot should be asphalted with an increased number of parking spaces. By moving the lot further away from the shore and utilizing the plated area in the middle this parking area could accommodate up to 65 automobiles, including designated RV and ADA accessible spaces.

The parking should still be planted where appropriate to provide shade and an increased aesthetic. It is important that these new plantings should not significantly block the views of private property owners. Plants should be tolerant of the on site requirements (See. Appendix)

The parking lot is also an excellent opportunity to install bioswales or other storm water mitigation devices. These devices could be built into the plantings and could collect all of the runoff from the parking area. Furthermore, these devices could be designed to require no maintenance and would greatly improve the ecological health of the area.

In addition to the primary parking area at Detroit Flats a second parking area has been included in the design just NW of the current parking lot. This parking area, while smaller than the primary one, should be designed to accommodate 10-15 automobiles.

Both parking areas should accommodate disabled parking with priority parking for these patrons near the facilities and trail heads where appropriate.

Fig. 7.5.7 - C; Detroit Flats Parking Proposed Plan

7.5.8 Design Component - Access

Current Conditions:

The overall access to the Detroit Flats area is good with the exception of a few key areas. The primary access point to the day use area is down Detroit Rd. which, despite the lack of signage (see Pg. 52) provides easy access to the site. However, public access along the shoreline has been disrupted by the encroachment of private properties and a lack of trails, signage or way finding elements. Furthermore, these areas do not provide universal access or accommodate in any way disabled users.

Fig. 7.5.8 - A,B; Detroit Flats Access Existing Conditions

Recommendations:

To increase accessibility in this area the design recommends the installation of a number of new trails. These trails should be constructed from asphalt and be fully ADA accessible. New trail heads, signs and way finding elements should be employed throughout the site to designate areas and access points.

These trails have been moved away from the shoreline in an effort to reduce conflict with local residents and private property owners. Trails, instead, have been moved along the chain of islands as recommended by the new design of Detroit Flats.

Bridges (see Pg. 66) connect these paths where needed and still allow boat access in key areas.

Pedestrian access is still available down Patton St., however, vehicle access is restricted in this area to Forest Service Vehicles only. Similarly, access to Piety Island via Detroit Flats is available only to Forest Service vehicles as well. This route to the island, available only in the winter, should follow the existing road as much as possible and may need to be moved in the future to accommodate the design work outlined in this document.

Fig. 7.5.8 - C; Detroit Flats Access Proposal

7.5.9 Design Component - Signage

Current Conditions:

Signage is lacking greatly here. There is very little signage to direct visitors to places and very little signage to identify places. Numerous “No Trespassing” signs near property lines create an unwelcoming ambiance. Directional signs leading to designated trails, destinations and points of interest are needed.

In general, signage is greatly needed here for wayfinding and imageability. Existing signs are primarily posted for the purpose of deterring unlawful activities. Additional signs are needed to promote desirable activities, make visitors feel welcome and foster a sense of stewardship for the land.

Fig. 7.5.9 - A,B; Detroit Flats Signage Existing Conditions

Recommendations:

Directional signage, guiding visitors to and through the parking, loading and day use area is necessary here. A large map of the lake area with key places to visit is needed to inform visitors of recreational opportunities in the area. Other key signs to be included here are: trail head signs, directional signs with distances and times of walking routes, signs along motor vehicle routes directing drivers to parking areas, docks, and amenities.

Directional signs specific to pedestrian traffic include restroom signs, garbage/recycling facilities signs, fishing docks, ADA accessible routes, bike route signs, picnic tables, swimming areas, interpretive signs for natural processes, and restaurants or other business establishments.

Identity signage is also necessary to increase the imageability of Detroit Flats. A gateway, welcome or threshold sign letting visitors know they have arrived is valuable to the imageability of the area.

Fig. 7.5.9 - C-G; Detroit Flats Signage Recommendations

7.5.10 Design Component - Boat Access

Current Conditions:

Current access to and from the water in the Detroit Flats area is strong with a few exceptions. Although the land is public, problems with local private property owners has reduced ingress egress in some areas. The eroded shoreline also makes accessibility more difficult as do the limited number of paths to and from the water. Fluctuating water heights throughout the year add yet another component to the problems of accessibility. The majority of the site is undeveloped with a limited number of paths.

The old road currently provides an informal boat launch in the SE corner of the site (Fig. 7.5.10 - A,B), next to the day use area, however motorized boat access here is discouraged—despite this fact, it is a common occurrence. Boats are commonly docked here on the shoreline by day use boaters who are looking to spend some time ashore.

Fig. 7.5.10 - A,B; Detroit Flats Boat Access Existing Conditions

Recommendations:

Improvements to water accessibility begin with the rebuilding and stabilization of the shoreline in all eroded places. This stabilization will help to create a more gentile slope to the waters edge in the bioengineered areas or, conversely it will step down to the water in areas that require a more serious treatment of gabions and riprap.

An improved, universally accessible, trail system (See Pg. 40) will also help better connect users with the water as will a new switchback ramp which will allow easy access to the waters edge for disabled users. This system, constructed from concrete, will allow accessibility year round regardless of the height of the water and could also be used as a place for "car-top boats" (Kay-aks, etc) to launch.

Detroit Flats will also have a number of offshore boat tie-ups for summer boaters who commonly dock just offshore here. In addition to this an improved day use area at Detroit Flats will also allow users to access the water from a sheltered and constructed structure.

7.5.11 Design Component - Bird watching Platforms

Current Conditions:

Detroit Flats is well known as a bird watching area. With a unique ecosystem and resting point for migratory birds, Detroit Flats has made its way onto the Audubon societies list for top 100 bird watching areas. However, despite the nature of this site there are few opportunities or areas to actively view birds. Furthermore, the habitat here is being threatened by increased boating, a degraded environment and invasive plant and animal species.

Fig. 7.5.11 - A; Detroit Flats Bird Watching Existing Conditions

Recommendations:

In an effort to strengthen this character of the site the design recommends the installation of a number of bird watching platforms which will provide strong views into the landscape and to bird habitat. These platform, positions across form one another in the new bay area, should be constructed from wood. Architecturally, these structures should match Forest Service design guidelines that are consistent with the Cascadian Style. These structures should sit above ground 5-10' and provide users with long, unfettered, views of the landscape.

The bird watching structure on the east side of the bay should be designed to accommodate wheelchairs and other disabilities with a ramp that allows access to at least the first tier of the platform structure, which will affor raised views of the surrounding area. This will most likely require a combination of topographic changes in the landscape immediately surrounding the structure, as well as a switchback ramp system.

Plants in this area should be selected based on their habitat value and ability to accommodate and promote avian life. The majority of these plants should not reach a mature height of more than 10' as they will restrict views from the shoreline (see appendix A).

Fig. 7.5.11 - B,C; Detroit Flats Bird Watching Platform Suggestions

7.5.12 Design Component - Roads

Current Conditions:

The current roads in the Detroit Flats area, while functional, could use improvements. In many places potholes and uneven surfaces make driving difficult or unpleasant. More so, gravel roads on site create dust and require maintenance.

Fig. 7.5.12 - A; Detroit Flats Roads Existing Conditions

Recommendations:

Roads should be asphalted where possible and systems employed to mitigate storm water from runoff. These systems could include bioswales, flow through planters, or wetland mitigation. Gravel roads should be replaced where possible with asphalted for easier access and less maintenance. Connections to the new parking lots should be taken into account when designing these roads.

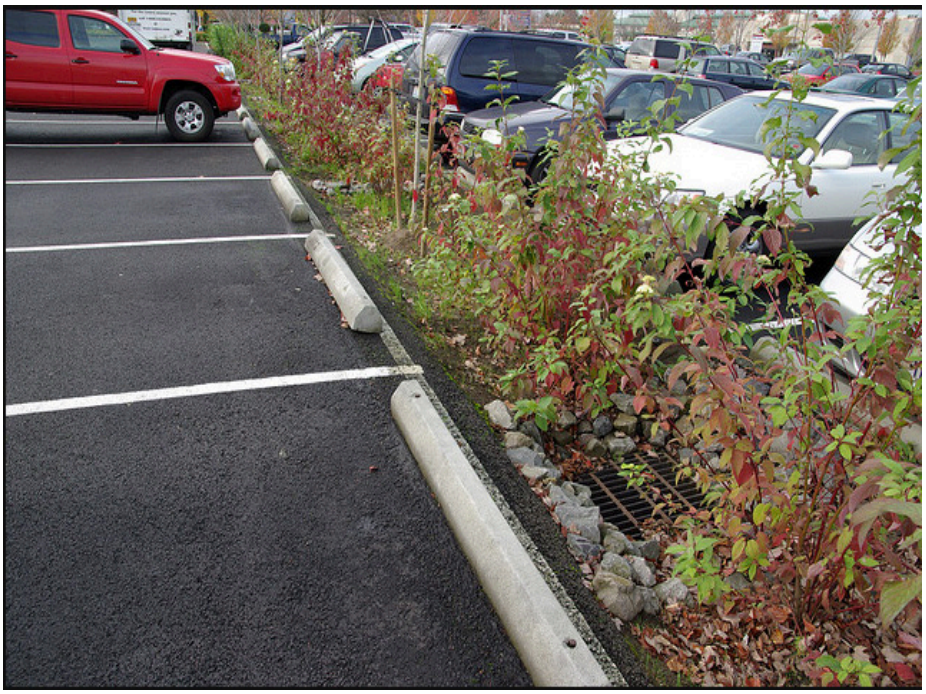


Fig. 7.5.12 - B; Detroit Flats Road Treatment Suggestions

7.5.13 Design Component - Habitat

Current Conditions:

Detroit Flats offers a strong and unique place for wildlife. A number of aquatic, terrestrial and avian species can be found here in this area and the site is listed as a top bird watching site. With the exception of a few invasive plant species (primarily Reed Canary Grass and Himalayan Blackberry) this area is an excellent ecosystem that should be preserved as much as possible.

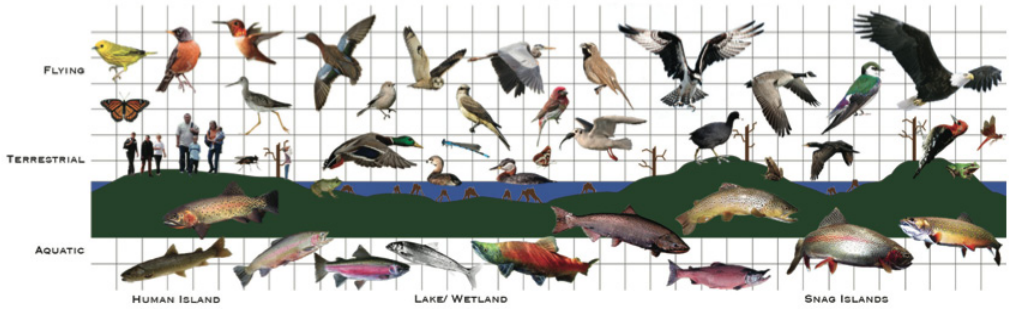


Fig. 7.5.13 - A; Detroit Flats Habitat

Recommendations:

Strong measures should be taken in the design and construction phases of this project to ensure that this area will be preserved and improved upon as much as possible. Specifically, the design recommends the removal of all invasive species and the replanting of native plants that encourage wildlife. Habitat for birds, fish and other animals must be preserved at all costs. Bird posts should be included in the design for Osprey nests. Snags should also be included in the planting of this area.

Existing stumps that will be removed in the construction process should be replaced along the shoreline to provide habitat and shoreline stabilization. It is important that in the work done here designers work closely with wildlife and fish biologists to achieve the best possible outcome.

Fig. 7.5.13 - B-D; Detroit Flats Habitat

7.5.14 Design Component - Primary Day Use Area

Current Conditions:

This is a popular place for families to gather at all times of the year. From here people can walk to Piety Island when the water is low. This is also a central starting point for bird watching in the greater Detroit Flats area. During peak boating season many find this an ideal location to moor boats, pick up and drop off passengers, fish from the banks, swim in the warm shallow water, float on small rafts, launch kayaks or canoes, or simply meet up and enjoy the views.

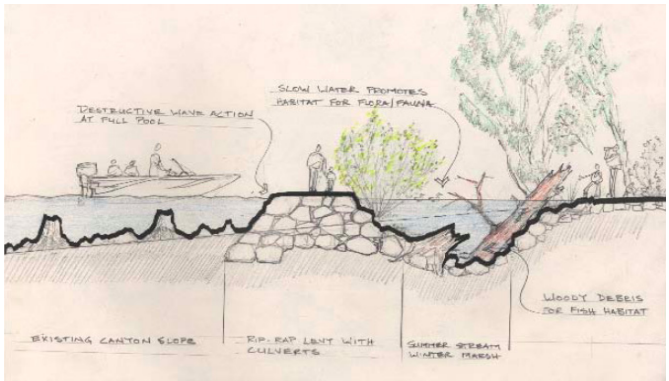
Riprap treatments of parts of the shoreline here have helped to preserve some integrity, but most of the area is still in need of repair and enhancement.

Fig. 7.5.14 - A; Detroit Flats Existing Primary Day Use Area

Recommendations:

A comprehensive wholistic plan for this area includes a shoreline stabilization strategy, improved restroom facilities, and the enhancement of desired and popular activities such as bird watching, swimming, picnicing, fishing, boat mooring, kayaking, hiking and bicycling.

Fig. 7.5.14 - B; Detroit Flats Day Use Area Proposal



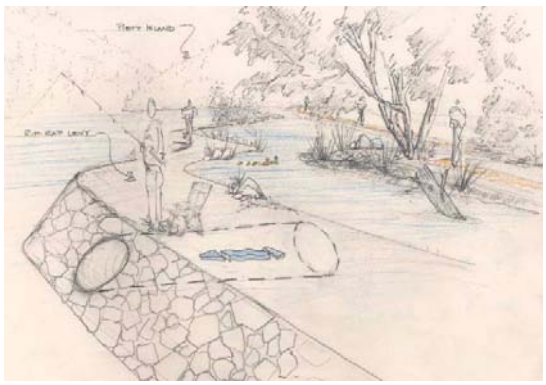


Fig. 7.5.14 - C,D; Detroit Flats Day Use Area Proposal

7.5.14 Design Component - Primary Day Use Area (continued)

Recommendations:

This beach area design combines ADA accessible fishing platforms with boat mooring stations, while accommodating swimmers and floaters in a safe bay, protected from boats and fishing tackle. Large logs, placed vertically on a grid pattern provide not only essential habitat for fish and other aquatic creatures but also can be used as anchors for mooring boats (outside of the designated shoreline water access area). Deeply anchored, these logs also reinforce shoreline stability, while adding a rhythmic metering to the landscape aesthetic, reminiscent of the forests that once inhabited this area as well as the agricultural forms supported by the creation of the Detroit Dam.

Fig. 7.5.14 - E,F; Detroit Flats Day Use Area Proposal

Recommendations:

Fig. 7.5.14 - G; Detroit Flats Day Use Area Proposal

7.5.15 Design Component - Bridges

Current Conditions:

The creation of an island chain in the Detroit Flats area brings with it the need for access to the islands. Specifically, in an effort to accommodate boaters and pedestrians the design requires the construction of a number of bridges and one land bridge with water culvert.

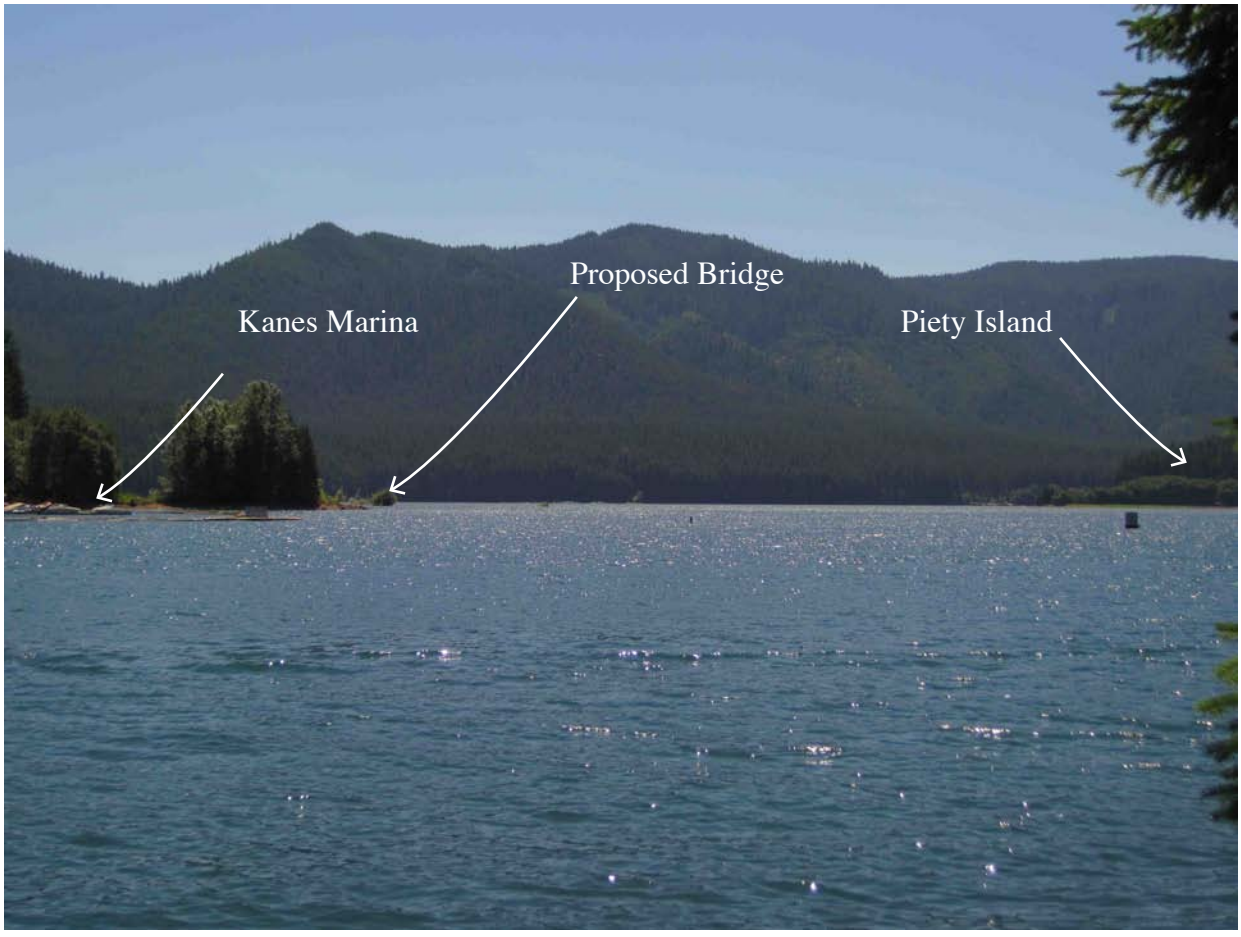


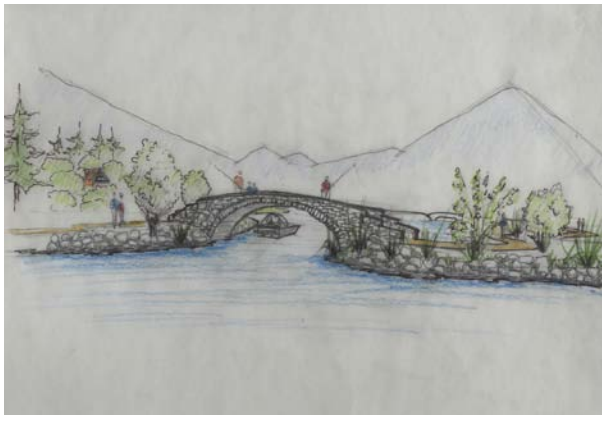
Fig. 7.5.15 - A; Detroit Flats Existing Conditions (Without Bridge)

Recommendations:

The primary bridge in the NW corner of the site helps connect users with Kanes marina and the primary day use area at Detroit Flats. This bridge needs a base height of 1580' to allow an 11' clearance for boats underneath with the water at a high of 1569'. The bridge should also be universally accessible with a moderate slope of 4.9 – 8.3% for wheelchair access. Structurally and architecturally this bridge should conform to Forest Service design guidelines that are consistent with the Cascadian Style. Local basalt rock would be the preferable material in the construction of this bridge.

Other bridges at Detroit Flats do not require boat access underneath and therefore require less demanding engineering. These bridges should still conform to ADA guidelines as well as Forest Service design guidelines that are consistent with the Cascadian Style. These bridges may be constructed from wood or metal and need only be 6' wide with railings.

The land bridge and water culvert in the middle of the design area should be large enough for a 6' wide path to cross over the top but wide enough so that large flows of water can move underneath it. It is the primary concern of this design component that safe access can be given and that water will not stagnate in this area.



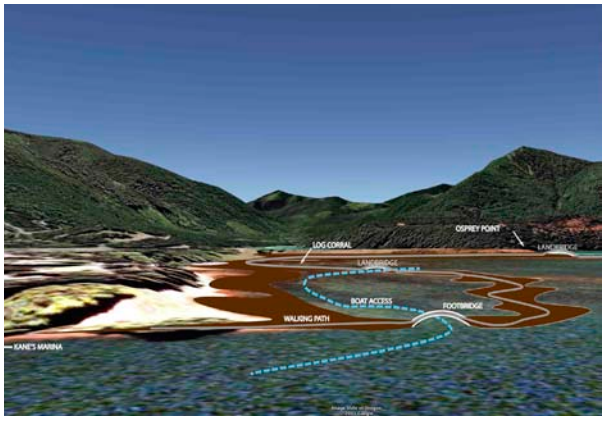


Fig. 7.5.15 - B,C; Detroit Flats Islands with Bridge Proposal

8.0 Piety Island

8.1 Analysis of Current Conditions

Piety Island is a fee campground in the middle of Detroit Lake just SW of Detroit Flats that currently serves boaters and campers. It is replete with a campground of 22 sites, toilets, picnic tables and a trail that leads travelers to the top of the Island, Piety Knob. "Windows" were created here to allow views out onto the landscape. The shoreline on the S – SE side of the island is eroding and needs stabilization. During winter months when the lake's water levels are low Piety Island is connected to Detroit Flats via a long peninsula.

8.2 Opportunities and Constraints

Piety Island is the most removed of the campgrounds and sites covered by this project. Due to its more natural and removed nature this campground offers a unique opportunity to preserve and enhance this character. Furthermore, because the island is only accessible by boat for six months of the year, and by foot the other six, this site is especially untouched.

The views from Piety Knob are spectacular but are seldom enjoyed. These areas especially need enhancements.

The existing bay area on the eastern side of the site, next to the campgrounds, is extremely shallow and could be excavated in places to enhance the boating experience and accessibility. The spoils from this excavation could be used to extend parts of the island and increase camping areas.

8.3 Objectives

- Stabilize eroding shoreline and incorporate a boat access and moorage into the design.
- Increase camping size and quality of experience vis-à-vis improvements to facilities, materials and signage
- Improve access to and quality of trail system
- Protect and enhance all ecological systems and habitat
- Create a removed and naturalistic sense of place

8.4 Design

The design of Piety Island includes the expansion of the camping areas, improved rest room facilities, new garbage and recycling areas, extended season boat mooring, improved campgrounds, increased vegetative screening, an improved trail head and system to Piety Knob and the dredging and subsequent protection of the existing bay.

Among the earthwork projects encompassed by this study the dredging and relocation of soil from the Piety Island bay is one of the paramount excavations. The design specifically calls for the removal of soil in the bay on the Eastern side of the island so as to provide year round water access to the island. The excavated soils have been placed around the existing high point topography to create a contained bay for safe swimming, docking and more camping spaces on the island.

Increased vegetative screening also helps separate campers from one another thus creating a better sense of privacy. An extended and improved trail system through the camping sites helps connect people throughout the site. This trail system also extends to the trail to Piety Knob. Better signage and access to the trail and viewing areas at the Knob increase the recreational experience. New seating areas at the summit help frame views out the four “windows”.

Two new boat docks also help increase access by providing a safer and more direct way for boats to moorage. These two docks are directly attached to the new day use area on the island which provides better access to Piety Knob through the creation of a better trail head. This day use area also incorporates new interpretative and directional signage as well as improved garbage and recycling facilities.

8.5 Design Components

The following section explores specific design components in greater detail as they relate to the Piety Island area and design. These components are intended to address the primary problems and concerns at this site and may suggest more than one option or solution.

8.5.1 Design Component - Campsite Improvements

Current Conditions:

Campsites at Piety Island seek a number of improvements to maximize the camping experience and accessibility. Specifically, access to the campsites from the shoreline is undefined and needs improvement. Furthermore, access to the campsites from the path system, while defined, could use improvement including new signage, paths and stairs where appropriate. The existing campgrounds also have little privacy from one another and are poorly defined both in location and site to site.

Fig. 8.5.1 - A,B; Piety Island Campsite Existing Conditions

Recommendations:

The design recommends improving these campsites so as to better define their location and boundaries, as well as provide increased screening and privacy. Specifically, campsites should have clearly defined paths leading to them and stairs where necessary. New signage should clearly demarcate the campsite number where the campsite trail meets the main trail.

Access between the water and the campsites should be improved with a clearly defined trail between both and additional signage at the shoreline referring to the campsite number.

Each site has increased vegetative screening (Pg. 74) to maximize privacy and the camping experience. Each campground has also been outfitted with picnic tables and fire rings for campfires or cooking.

For campsites with close proximity to the water views should be preserved and small trails established for easy access. This will help to protect the new vegetative screening pants as they establish themselves in the first few years.

8.5.2 Design Component - Privacy

Current Conditions:

Due to their layout and low numbers of surrounding vegetation the current campgrounds at Piety Island have little privacy and feel exposed. Views into adjoining campsites diminish the privacy and intimacy of the camping experience as well as create a feeling of uncomfortableness and vulnerability. Furthermore, the want for nature and a natural camping experience cannot be appropriately achieved given this camping style.

Fig. 8.5.2 - A,B; Piety Island Campsite Privacy Existing Conditions

Recommendations:

It is the recommendation of the design to increase vegetation between and around campsites so as to block views in and out of campsites. This increase in vegetation will help to maximize privacy as well as create a more natural aesthetic.

These vegetative screens should utilize plants of a medium height (4-10') with a dense growth that are native and tolerant of site specific conditions (See Appendix). Plants should also be chosen on their resilience to human use (ex. firewood, marshmallow sticks, etc.). Establishing these plants will take time and will require protection to ensure their survival during the first year or two. Temporary wood structures can be placed at the edge of campsites to deter trampling of these new plants during this time.

8.5.3 Design Component - Soil Excavation and Spoils

Current Conditions:

On the east side of Piety island, in the area directly adjacent to the campgrounds, sits a small bay-like area that is a result of the existing topography. This formation creates a partially protected bay that is often used for swimming, bird watching and as a place for recreational boaters to congregate. During the non-summer months when the reservoir is drained this formation becomes clearly visible and is an excellent area for wildlife – especially birds. Small amounts of water pool up in this area in the winter, however for the most part this area remains dry for the majority of the year.

Due to the height of this bay, boating access is limited which also results in limited access to the island. Furthermore some of these high spots pose a potential risk for boaters.

Fig. 8.5.3 - A; Piety Island Campground Waterfront Existing Conditions

Recommendations:

It is the recommendation of the design to dredge this area to create a lower depth and relocate the spoils from this project to the proposed bay extension as designated in the new design of the Piety Island area. As this soil is already from the lake bottom it will ecologically and geologically match – using this soil will also not affect the storage capacity of the lake.

An assessment of the amount of soil to be removed must still be completed and an average depth of dredging agreed upon.

This dredging operation could be coordinated with the channel widening project or other projects of a similar nature. The spoils from any of these projects could be used in the extension of the bay – however, priority should be given to the dredged bay soil. The minimum height of the bay extension should be 1570' and should follow the form as outlined in the design.

8.5.4 Design Component - Trailhead

Current Conditions:

The trail leading to the summit of Piety Island is not only hard to find but the sign for the trail head is also hard to find until hikers are well on the trail. The trail begins near the restroom facilities, however there is much need for an improvement of wayfinding and imageability at the trail head through signage, plantings, clearing of vegetation or other strategies.

Fig. 8.5.4 - A,B; Piety Island Campground Waterfront Existing Conditions

Recommendations:

Signage is critical here. A sign clearly identifying the trail head is needed here. A map of the trail and trash receptacles, along with trail information is suggested. Maintenance is also a crucial component to the trailhead design. Plants should be kept from growing over the trailhead and obscuring it. A proper path from the dock with signage leading to the trailhead will greatly help people find their way.

8.5.5 Design Component - Trails

Current Conditions:

The trail leading to the summit of Piety Island follows an old skid road used during the timber harvest on the island. It is wide and easily navigable. There are several clearings along the existing path that were created years ago to open views out over the lake from the island. The pinnacle view of Mount Jefferson is at the summit, framed by tall fir trees. There is also an excellent view of Tumble Falls. This is an experience to be highlighted and promoted for area visitors.

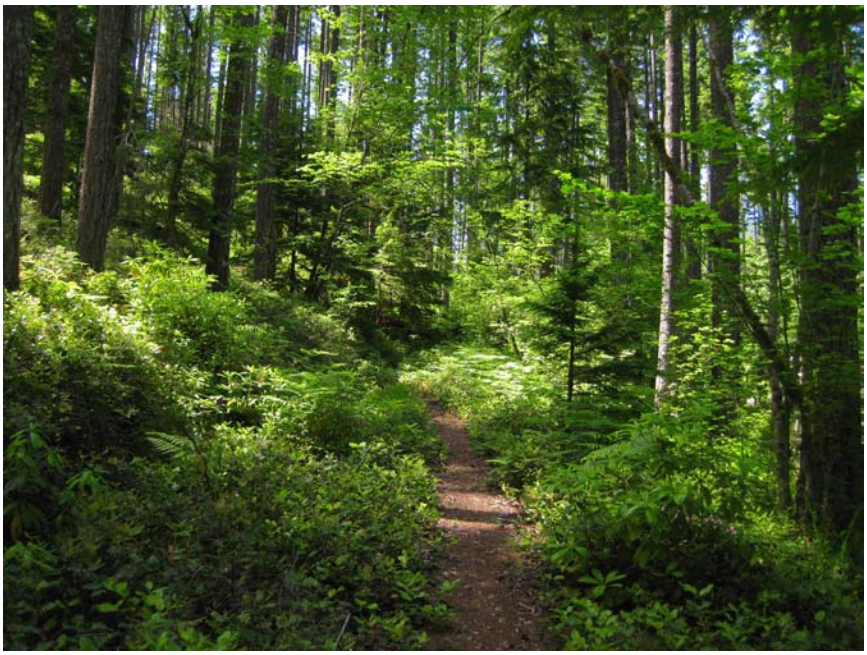


Fig. 8.5.5 - A,B; Piety Island Trails Existing Conditions

Recommendations:

Intended to suit users seeking a primitive experience, these trails are designed to provide a clear route through forest land with minimal annual maintenance. Trails built on steep hillsides are to follow full-bench construction methods, minimizing the risk of failure in wet weather conditions.

The existing trail to the summit of Piety Island needs little improvement. It is usable in its current state. The only improvement recommended here is in the advertisement of the trail. Few area visitors know of the trail without having been to it or having seen it on a map. Maps of the area posted at key locations, such as Kanes Marina, Detroit Flats Day Use Area and within the overnight campground at Piety Island should clearly note this trail and its views as an area attraction.

At the top of Piety Knob the trail ends despite the fact that there are a number of viewing areas at the top. The trails to these viewing areas need significant improvements as they are almost impossible to find and do not read as trails. Proper signage is also needed here to help direct people to the viewing areas. These trails will need maintenance once established but could use materials with extremely low maintenance needs. Definition is key.

8.5.6 Design Component - Shoreline Stabilization

Current Conditions:

As the water level in Detroit Lake rises and falls annually in response to flood control needs, which are based on seasonal runoff volumes, the soil horizon of the steep canyon slopes quickly erodes away. The mixed-conifer and broad-leaf deciduous forest environment surrounding the lake thrives in soft well-drained sedimentary soils. These soil types do not hold up to erosional forces of lake waves, therefore soil stabilization is needed.

Erosion processes are a natural part of the hydrologic cycle and provide essential habitat for plants, fish and wildlife as well as ecosystem services such as water filtration and soil formation. Erosion of Detroit Lake's 32 miles of shoreline however is arguably unnatural, as it is a product of the man-made Detroit Dam, built in 1953 to control flooding.

Erosion is most extreme at elevations near the normal pool water level of 1'563.5 feet during the summer season when strong wind waves and boat wakes breakdown the softer sedimentary layers of the steep banks. For six months of the year, from mid-April until mid-September, the water level is typically between 1,554 feet and 1566 feet. This section of the shoreline is in critical need of stabilization.
Bank stabilization is particularly important at locations along the shoreline within the three specified areas of this project, Detroit Flats (including Kanes Marina), Piety Island, and Santiam Flats.

Shorelines at Piety Island are exposed to extreme weather conditions. Strong wave action and high volumes of boaters mooring along the shoreline have accelerated the erosion processes here, particularly along the southeast shoreline, where the banks composed of soft sediment and rounded cobbles are very steep and susceptible to erosion.

Fig. 8.5.6 - A,B; Piety Island Shoreline Stabilization Existing Conditions

Recommendations:

There are four general approaches to shoreline stabilization.

1. Non-structural
2. Structural
3. Bioengineering
4. Biotechnical

Non-structural options include land use management and planning, public education, and re-vegetation with native species. These types of efforts could potentially incorporate participation of youth corps work crews, local volunteers, citizens and concerned homeowners.

Structural options include revetments, stone riprap, gabion mattress, seawalls, concrete walls, gabion walls, bulkheads (sheet piles, steel/timber cribbing), groins, and breakwaters. The cost of these methods is typically more expensive than that of other methods. Materials for these structures must travel long distances, increasing construction costs considerably.

Bioengineering options include live staking, contour wattling, brush layering, and brush matting. While it is true that a streambank's primary role is to confine stream flow, there is a strong biological value related to "edge effect" and biodiversity. The transition area between water bodies (streams, rivers, and lakes) and upland areas is called the riparian zone, and it represents some of our most valuable and diverse fish and wildlife habitats. The outdoors man knows this is where he can find a brook trout lying under a root waiting for a caddis fly to drift by, where red foxes hunt mice, where muskrat and beaver build their lodges, where deer and frogs feed, and where turtles sun themselves. Accelerated erosion of streambanks can degrade these habitats, and some types of streambank protection such as concrete retaining walls and riprap can destroy this critical habitat. –Robbin Sotir Biotechnical and Soil Bioengineering Slope Stabilization.

Biotechnical options include erosion control matting, vegetated riprap (joint planting), vegetated gabion walls, vegetated gabion mattresses, and vegetated cribbing or live cribbing. Live cribbing includes the use of large logs with or without root wads. These methods could incorporate local materials such as rock, native riparian plants, and wood debris collected on Detroit Lake during the annual Lake Sweep.

For Piety Island, Biotechnical options are highly recommended as the area is seemingly remote and undisturbed to most area visitors and the idea of a "natural getaway" is more compatible with biotechnical approaches, which most aim to blend with the wilderness aesthetic, using natural materials such as living materials to reinforce eroding surfaces.

8.5.7 Design Component - Signage

Current Conditions:

Signage is lacking greatly here. There is very little signage to direct visitors to places and very little signage to identify places. Numerous “No Trespassing” signs near property lines create an unwelcoming ambiance. Directional signs leading visitors to designated trails, destinations and points of interest are needed.
In general, signage is greatly needed here for wayfinding and imageability. Existing signs are primarily posted for the purpose of deterring unlawful activities. Additional signs are needed to promote desirable activities, make visitors feel welcome and foster a sense of stewardship for the land.

Fig. 8.5.7 - A,B; Piety Island Signage Existing Conditions

Recommendations:

Directional signage guiding visitors to and through the boat mooring areas, loading and day use area is necessary here. A large map of the lake area with key places to visit is needed to inform visitors of recreational opportunities in the area. Other key signs to be included here are: trail head signs, directional signs with distances and times of walking routes, and signs for amenities such as restrooms, trash and recycling facilities.

Directional signs specific to pedestrian traffic include restroom signs, garbage/recycling facilities signs, fishing docks, ADA accessible routes, bike route signs, picnic tables, swimming areas, interpretive signs for natural processes, and restaurants or other business establishments.

Identity signage is also necessary to increase the imageability of Piety Island.

Fig. 8.5.7 - C-G; Piety Island Signage Recommendations

8.5.8 Design Component - Views

Current Conditions:

The top of Piety Island (Piety Knob) has a number of viewpoints that were recently created by timber harvest. These viewing areas or 'windows' provide unique and stunning views of the landscape, including Mt. Jefferson and Tumble Falls. However, these areas are difficult to find as they have not been properly demarcated. Currently there are no signs, maps or other way finding points to bring people to these areas. Furthermore, the trails leading to them are difficult to find and do not clearly read as trails.

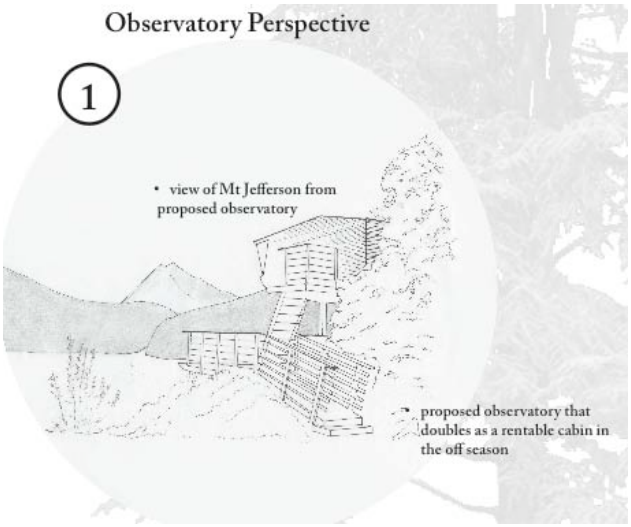
Fig. 8.5.8 - A,B; Piety Island Views Existing Conditions

Recommendations:

It is the recommendation of the design that the trails leading to these viewpoints be better demarcated and maintained. Signs and way finding elements should be included at the top of the island as well so that users can find the viewpoints.

Viewpoints should have interpretive signage at each location as well as a seating area or other built structure that clearly defines the space.

Fig. 8.5.8 - C,D; Piety Island View Recommendations



8.5.9 Design Component - Access

Current Conditions:

Access to Piety Island is a limiting factor for recreation and use. During the summer months the island is only accessible by boat and has no formal dock or landing area. During the winter months the island is accessible by foot only by walking across the flats. The Forest Service maintains a winter road to the island for service only. This road is not open to the public.

Fig. 8.5.9 - A,B; Piety Island Access Existing Conditions

Recommendations:

The design recommends the creation of a dock in the new Piety Island bay for easier boat access and an extended boating season. This dock should be manufactured from durable materials (metal) and should be able to withstand low to no water levels during the winter months. Slope from this dock to the shoreline is an important consideration, as it cannot exceed an 8.3% slope for accessibility reasons.

Boat tie-ups should be added to every campsite area and an accessible path installed between the shoreline and the campgrounds. Boat coves have also been included in the design. These coves have been designed to protect boats sitting in the Piety Island bay through by creating topographic changes in the landscape.

Vehicle access to the island should be maintained and should follow the existing road. However, the path of this road may need to be changed based on various factors from the design components outlined in this document.

8.5.10 Design Component - Facilities and Amenities

Current Conditions:

Currently, the facilities at Piety Island are limited in both number and quality and need serious improvements to accommodate for both an increased number of users as well as to meet an improved landscape vernacular. Restrooms on site consist of CXT Cascadian style vault toilets. These restrooms function well but cannot accommodate the newly proposed additional campsites on the island. On site trash receptacles are limited and are often full or overflowing from increased use and recycling receptacles of any kind do not exist. Seating consists of picnic benches at each campground which function well, however, the new day use area on the island will need increased seating to accommodate an increased number of people visiting this area. The top of Piety Knob and the 'windows' looking out have no seating or designated viewing area which add to their undefined nature. Fire rings at each campground offer a safe and contained place for users to make a fire. These rings are durable and are generally in good condition.

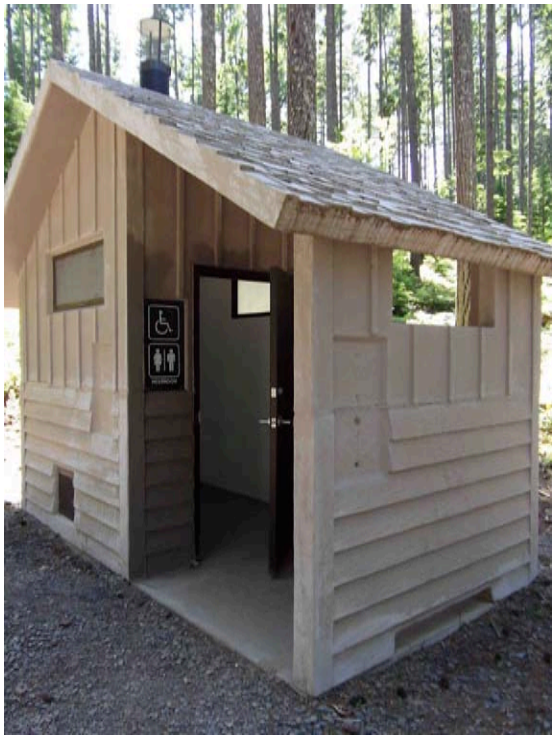


Fig. 8.5.10 - A,B; Piety Island Facilities and Amenities Existing Conditions

Recommendations:

The design recommends the installment of a new restroom facility on site to accommodate for increased camping and usage. Cascadian vault toilets (currently used here) should be used. The new restroom will be placed on the Northern tip of the camping area. All restrooms must have a 100 foot setback from the water and should sit above the 1569 foot contour. Restrooms should meet the specifications and requirements as outlined in the West Cascades National Scenic Byway Corridor Plan; Detroit Lake Composite Management Guide; The Built Environment Image Guide For National forest and Grasslands; Universal Access Outdoor Recreation: A Design Guide.

New garbage and recycling areas have also been included in the design so as to accommodate for increased use. These receptacles should be constructed from durable materials (concrete, metal or plastic) and should aim to match the image requirements outlined in The Built Environment Image Guide For National forest and Grasslands. One option could include containing these receptacles within a wooden enclosure to achieve a better aesthetic.

New seating has been included in this design so as to accommodate a greater demand. These seats have been placed around the site and should consist of wooden picnic tables like those currently found on site, however, single bench seating is also desirable in select locations. These new seats should be constructed from durable materials (wood) and should aim to match the image requirements outlined in The Built Environment Image Guide For National forest and Grasslands. Specifically, seats at the top of Piety Knob should utilize the 'windows' and face outwards for maximum results.

The design also recommends the addition of new fire rings and picnic tables at each additional campsite.

9.0 Santiam Flats

9.1 Analysis of Current Conditions

Currently, Santiam Flats exists as a campground just Northwest of where the N. Santiam River meets Detroit Lake. Originally used for dispersed camping this area was improved a few years ago, receiving 32 designated campsites, metal fire rings, picnic tables, parking and toilets. It's proximity to the lake provides an ideal opportunity for improved access and recreational opportunities. The site seeks a new design that can accommodate increased use and camping as well as protect and improve the native vegetation and wildlife. New materials and signage should be incorporated per the master plan.

9.2 Opportunities and Constraints

Because Santiam Flats is currently a largely undeveloped site there is room for a significant intervention. Specifically, roads, amenities, campsites and vegetation can be moved or removed to accommodate a new design.

Santiam Flats is also connected to the city of Idanha's water system that could allow for safe flowing water on site.

The campsite is also managed by a third party with a campsite host who maintains the campground.

The site is often used as a day use area on the Western side of the site. Swimmers, boats and people fishing often use this popular spot, however the current site cannot accommodate these numbers.

9.3 Objectives

- Provide better screening from highway and access to aquatic opportunities including boat ties, fishing areas and viewing
- Increase camping size and quality of experience vis-à-vis improvements to facilities, materials, signage and access
- Protect and increase natural habitat
- Restore shoreline and prevent erosion
- Increase year-round use of the site

9.4 Design

The design at Santiam Flats aims to create more and better camping areas for public use as well as improve upon the existing day use area at the West end of the site. Among the improvements are new signage, rest room facilities, new water access, fishing opportunities, increased vegetative screening, better parking and roads and a diverse set of camping areas including a number of new yurts.

A new layout for the site has helped increase the number of campgrounds from 32 to 40 and has improved intra-site privacy and the camping experience.

On the north side of the site a number of new RV camping spaces have been provided. Due to the proximity to the highway it was deemed appropriate to place these vehicles in this location, as the sound would be lease disruptive to this camping style. Also, due to the size and materials of these vehicles they have the potential to reduce the sound coming into the site.

The middle of the site primarily consists of for reservation yurt camping. Much like the RV area, these yurts were placed in this location in an effort to reduce sound from the highway. Below these yurts, next to the river, the tent camping has been located. This proximity to the water and away from the highway creates a more natural camping experience.

Increased vegetation between camping areas also helps create better privacy and helps to reduce excessive sound in or outside the site. These screenings will consist of native vegetation and will also help frame views out to the river where appropriate.

9.5 Design Components

The following section explores specific design components in greater detail as they relate to the Santiam Flats area and design. These components are intended to address the primary problems and concerns at this site and may suggest more than one option or solution.

9.5.1 Design Component - Campsite Improvements

Current Conditions:

Campsites at Santiam Flats are poorly laid out and require a number of changes. Primarily, the campground layout does not maximize space or efficiently accommodate large numbers of campers. Furthermore, the existing campgrounds have little privacy from one another and are poorly defined both in location and site to site.

Fig. 9.5.1 - A; Santiam Flats Campsite Existing Conditions

Recommendations:

The redesign of Santiam Flats seeks to maximize the number of campgrounds while increasing the quality of the camping experience. Specifically, a new campground layout has increased the number of camp sites to 40, with designated areas for RV's, tents and yurt camping. Each site has increased vegetative screening (Pg. 98) to maximize privacy and the camping experience. Each campground has also been outfitted with picnic tables and fire rings for campfires or cooking.

For campsites with close proximity to the water views should be preserved and small trails established for easy access. This will help to protect the new vegetative screening pants as they establish themselves in the first few years.

9.5.2 Design Component - Privacy

Current Conditions:

Due to their layout and low numbers of surrounding vegetation the current campgrounds at Santiam Flats have little privacy and feel exposed. Views into adjoining campsites diminish the privacy and intimacy of the camping experience as well as create a feeling of uncomfortableness and vulnerability. Furthermore, the want for nature and a natural camping experience cannot be appropriately achieved given this camping style.

Fig. 9.5.2 - A,B; Santiam Flats Campsite Privacy Existing Conditions

Recommendations:

It is the recommendation of the design to increase vegetation between and around campsites so as to block views in and out of campsites. This increase in vegetation will help to maximize privacy as well as create a more natural aesthetic.

These vegetative screens should utilize plants of a medium height (4-10') with a dense growth that are native and tolerant of site specific conditions (See Appendix). Plants should also be chosen on their resilience to human use (ex. firewood, marshmallow sticks, etc.). Establishing these plants will take time and will require protection to ensure their survival during the first year or two. Temporary wood structures can be placed at the edge of campsites to deter trampling of these new plants during this time.

9.5.3 Design Component - Facilities and Amenities

Current Conditions:

Currently, the facilities at Santiam Flats are limited in both number and quality and need serious improvements to accommodate for both an increased number of users as well as to meet an improved landscape vernacular. Restrooms on site consist of CXT Cascadian style vault toilets. These restrooms function well but cannot accommodate the newly proposed additional campsites at the site. On site trash receptacles are limited and are often full or overflowing from increased use and recycling receptacles of any kind do not exist. Seating consists of picnic benches at each campground which function well, however, the new day use area on the island will need increased seating to accommodate an increased number of people visiting this area. Fire rings at each campground offer a safe and contained place for users to make a fire. These rings are durable and are generally in good condition.

Fig. 9.5.3 - A; Santiam Flats Facilities and Amenities Existing Conditions

Recommendations:

The design recommends moving, or replacing, the existing CXT toilets on site to match the new design. As the site is connected to the city of Idanha's water system one possibility is to connect new restroom facilities to the municipal water system. However, where this is not appropriate the current CXT toilets can adequately accommodate demands. These restrooms must have a 100 foot setback from the water and should sit above the 1569 foot contour. New restrooms should meet the specifications and requirements as outlined in the West Cascades National Scenic Byway Corridor Plan; Detroit Lake Composite Management Guide; The Built Environment Image Guide For National forest and Grasslands; Universal Access Outdoor Recreation: A Design Guide.

New garbage and recycling areas have also been included in the design so as to accommodate for increased use. These receptacles should be constructed from durable materials (concrete, metal or plastic) and should aim to match the image requirements outlined in The Built Environment Image Guide For National forest and Grasslands. One option could include containing these receptacles within a wooden enclosure to achieve a better aesthetic.

New seating has been included in this design so as to accommodate a greater demand. These seats have been placed around the site and should consist of wooden picnic tables like those currently found on site, however, single bench seating is also desirable in select locations. These new seats should be constructed from durable materials (wood) and should aim to match the image requirements outlined in The Built Environment Image Guide For National forest and Grasslands.

The design also recommends the addition of new fire rings at each additional campsite including the R.V. and yurt areas, respectively.

The addition of a new covered seating and recreation structure at the day use area at the West end of the site helps provide a sheltered location for events and gatherings. Structures like this one have been used at sites such as the Upper Arm day use area with excellent success. Seating should be incorporated into this design and the structure should conform to the specifications and requirements outlined in the West Cascades National Scenic Byway Corridor Plan; Detroit Lake Composite Management Guide; The Built Environment Image Guide For National forest and Grasslands; Universal Access Outdoor Recreation: A Design Guide.

9.5.4 Design Component - Access

Current Conditions:

The overall access to the Santiam Flats area is good with the exception of a few key areas. The primary access point to the day use area is off of highway 22. which, despite the lack of signage (see Pg. 108) provides easy access to the site. Access through the site is limited to the primary vehicle road through the site. This gravel road requires frequent maintenance and is the cause for increased dust in the site.

Furthermore, Santiam Flats does not provide universal access or accommodate in any way disabled users.

Fig. 9.5.4 - A,B; Santiam Flats Access Existing Conditions

Recommendations:

To increase accessibility in this area the design recommends the installation of a number of new trails. These trails should be constructed from asphalt and be fully ADA accessible. New trail heads, signs and way finding elements should be employed throughout the site to designate areas and access points.

The design also recommends replacing the existing gravel road with a new asphalt road. This road will not only require less maintenance than the existing gravel road, it will provide universal access throughout the site.

Access to the water will be greatly improved by the addition of a new day use area with armored shorelines (see Pg. 104), fishing areas (see Pg. 110), and universal water access.

Fig. 9.5.4 - C; Santiam Flats Access

9.5.5 Design Component - Shoreline Stabilization

Current Conditions:

Shoreline stabilization is critical at Santiam Flats. There is an extreme amount of wave action at this location from northeast bound wind waves. Erosion is progressing rapidly.

As the water level in Detroit Lake rises and falls annually in response to flood control needs, which are based on seasonal runoff volumes, the soil horizon of the steep canyon slopes quickly erodes away. The mixed-conifer and broad-leaf deciduous forest environment surrounding the lake thrives in soft well-drained sedimentary soils. These soil types do not hold up to erosional forces of lake waves, therefore soil stabilization is needed.

Erosion processes are a natural part of the hydrologic cycle and provide essential habitat for plants, fish and wildlife as well as ecosystem services such as water filtration and soil formation. Erosion of Detroit Lake's 32 miles of shoreline however is arguably unnatural, as it is a product of the man-made Detroit Dam, built in 1953 to control flooding.

Erosion is most extreme at elevations near the normal pool water level of 1,563.5 feet above sea level during the summer season when strong wind waves and boat wakes breakdown the softer sedimentary layers of the steep banks. For six months of the year, from mid-April until mid-September, the water level is typically between 1,554 feet and 1,566 feet (though levels could be as low as 1,542 feet during the popular boating season in years of drought). This section of the shoreline is in critical need of stabilization because it undergoes the most damage in a very short period of time.

Fig. 9.5.5 - A,B,C; Santiam Flats Shoreline Erosion Existing Conditions

Recommendations:

As a hub of activity, Santiam Flats supports many different types of recreation including motorized boating, kayaking, fishing, hiking, swimming, and bird watching. This variety of activities demands a variety of different shoreline stabilization treatments.

Recommended shoreline stability treatments include all four general approaches to shoreline stabilization as potentially successful remedies.

1. Non-structural
2. Structural
3. Bioengineering
4. Biotechnical

Non-structural options include land use management and planning, public education, and re-vegetation with native species. These types of efforts could potentially incorporate participation of youth corps work crews, local volunteers, citizens and concerned homeowners.

Structural options include revetments, stone riprap, gabion mattress, seawalls, concrete walls, gabion walls, bulkheads (sheet piles, steel/timber cribbing), groins, and breakwaters. The cost of these methods is typically more expensive than that of other methods. Materials for these structures must travel long distances, increasing construction costs considerably.

Bioengineering options include live staking, contour wattling, brush layering, and brush matting. While it is true that a streambank's primary role is to confine stream flow, there is a strong biological value related to "edge effect" and biodiversity. The transition area between water bodies (streams, rivers, and lakes) and upland areas is called the riparian zone, and it represents some of our most valuable and diverse fish and wildlife habitats. The outdoorsman knows this is where he can find a brook trout lying under a root waiting for a caddis fly to drift by, where red foxes hunt mice, where muskrat and beaver build their lodges, where deer and frogs feed, and where turtles sun themselves. Accelerated erosion of streambanks can degrade these habitats, and some types of streambank protection such as concrete retaining walls and riprap can destroy this critical habitat. –Robbin Sotir Biotechnical and Soil Bioengineering Slope Stabilization.

Biotechnical options include erosion control matting, vegetated riprap (joint planting), vegetated gabion walls, vegetated gabion mattresses, and vegetated cribbing or live cribbing. Live cribbing includes use of large logs with or without root wads.
These methods could incorporate local materials such as rock, native riparian plants, and wood debris collected on Detroit Lake during the annual Lake Sweep.

9.5.6 Design Component - Roads

Current Conditions:

The current road in the Santiam Flats area, while functional, could use improvements. Currently, this road is asphalted until the campground starts at which point it switches to compacted gravel. This gravel creates dust in the summertime and requires yearly maintenance. Furthermore, it is not universally accessible and would ultimately need to be replaced to match the new design of the campground.

Fig. 9.5.6 - A,B; Santiam Flats Roads Existing Conditions

Recommendations:

The entirety of the campground road should be asphalted and systems employed to mitigate storm water from runoff. These systems could include bioswales, flow through planters, or wetland mitigation. Connections to the new parking lots should be taken into account when designing these roads. New roads will be created in the campsite per the design.

9.5.7 Design Component - Signage

Current Conditions:

Signage is lacking greatly here. There is very little signage to direct visitors to places and very little signage to identify places. Directional signs leading visitors to designated trails, destinations and points of interest are needed.

In general, signage is greatly needed here for way finding and imageability. Existing signs are primarily posted for the purpose of deterring unlawful activities. Additional signs are needed to promote desirable activities, make visitors feel welcome and foster a sense of stewardship for the land.

Fig. 9.5.7 - A; Santiam Flats Signage Existing Conditions

Recommendations:

Directional signage, guiding visitors to and through the parking, loading and day use area is necessary here. A large map of the lake area with key places to visit is needed to inform visitors of recreational opportunities in the area. Other key signs to be included here are: trail head signs, directional signs with distances and times of walking routes, signs along motor vehicle routes directing drivers to parking areas, docks, and amenities.

Directional signs specific to pedestrian traffic include restroom signs, garbage/recycling facilities signs, fishing docks, ADA accessible routes, bike route signs, picnic tables, swimming areas, interpretive signs for natural processes, and restaurants or other business establishments.

Identity signage is also necessary to increase the imageability of Santiam Flats. A gateway, welcome or threshold sign letting visitors know they have arrived is valuable to the imageability of the area.

Fig. 9.5.7 - B-E; Santiam Flats Signage Recommendations

9.5.8 Design Component - Fishing Platforms

Current Conditions:

There is a current demand in the Detroit Lake area for more fishing areas and ADA accessible fishing platforms. Although attempts have been made in other areas there is still a demand for more accessible fishing areas. Similarly, Santiam Flats has a large demand for more fishing that has not been met.

Fig. 9.5.8 - A; Fishing Platform

Recommendations:

In an effort to meet these demands a number of fishing piers have been included in the redesign of the Santiam Flats area. The design recommends two options to meet this demand. The first of these designs employs fishing piers constructed from wood and similar in style to the one at Hoover Campground. Most likely, new soil will be needed to help keep these structures in place, however, this soil can come from any number of the proposed dredging projects at Kanes, Piety Island or Detroit Flats.

The second option employs a terraced system of steps and ramps that allows patrons to walk to the waters edge regardless of the height of the lake. This terraced system would be constructed from concrete and would need to conform to ADA specifications.

The length of these piers still needs to be determined and will be based in part on the existing topography at the sites.

Fig. 9.5.8 - B; Fishing Platform

9.5.9 Design Component - Yurts

Current Conditions:

Currently, Santiam Flats only provides camping opportunities to tent and RV users. In an effort to expand the recreational and camping opportunities on the site the design recommends the construction of 8 yurts.

Fig. 9.5.9 - A; Santiam Flats Existing Conditions (Without Yurts)

Recommendations:

These yurts could be installed one at a time as funding becomes available and could utilize other camping sites if demand were strong. Furthermore, the yurts could generate profit which could be used to buy new ones. Architecturally the yurts should conform to ADA guidelines as well as Forest Service design guidelines that are consistent with the Cascadian Style.

Fig. 9.5.9 - B,C; Santiam Flats Yurts Existing Conditions

9.5.10 Design Component - Day Use Area

Current Conditions:

The day use area at Santiam Flats is undefined and lacks recreational opportunities. Fishing and swimming are the two main activities here, however, the day use area has limited room to accommodate the demand and use. There are no tables or seating areas here in the day use area and users are forced to sit on the ground or occupy an adjacent camping site. A small parking area directly adjacent to the day use area is commonly used despite no parking signs.

Fig. 9.5.10 - A; Santiam Flats Day Use Existing Conditions

Recommendations:

The design recommends the creation of a better defined day use area at the Western tip of the site. This day use area will be replete with seating (see Pg. 100), fishing piers (see Pg. 110), universal water access and a new covered structure (see Pg. 114).

This structure should be constructed to Forest Service design guidelines that are consistent with the Cascadian Style. The structure at the Upper Arm Park is an accurate representation of this structure and should be drawn upon as a reference.

The day use area will also see an increase in shoreline areas as well as significant improvements to eroded shoreline areas. These improvements should provide more recreational space and opportunities for users.

9.5.11 Design Component - Parking

Current Conditions:

Current parking at Santiam Flats consists of individual campsite parking and a small day use area on the East side of the site. These areas are compacted gravel and only provide parking to a limited number of vehicles. They are not wheelchair accessible and cannot provide universal access.

Fig. 9.5.11 - A,B; Santiam Flats Parking Existing Conditions

Recommendations:

The design recommends asphalting the primary road in Santiam Flats and with that the individual campground parking sites as well. New RV camping areas have been designated on the Northern side of the site and will require asphalting as well. These RV sites require a parking area of 25 x 50' to accommodate for the different number of campers that will occupy the space.

The day use parking area will also require asphalting. It has been elongated to accommodate for increased use and parking.

Individual campground parking spaces should be asphalted and some should be elongated and widened to accommodate for small RV parking. These sites should have a parking area of no more than 15 x 25' to meet this demand.

An area directly next to the day use area has been set aside for disabled parking and easy access for dropping off supplies – it is not intended for long-term parking.

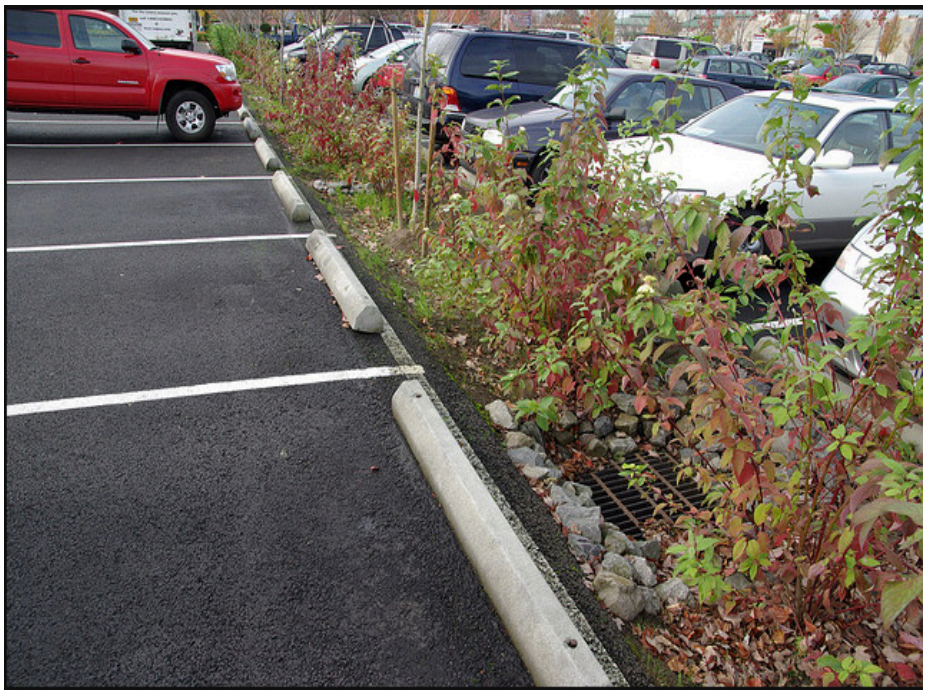


Fig. 9.5.11 - C; Santiam Flats Parking Treatment Suggestions

Appendix A
Native Plants List

Detroit Lake Restoration Project
Plants List

Native Oregon Trees - more than 100 ft (30 m) high

Abies grandis [Grand Fir]
Pinus lambertiana [Sugar Pine]
Pinus monticola [Western White Pine]
Pinus ponderodsa [Ponderosa Pine]
Pseudotsuga menziesii [Douglas Fir]
Thuja plicata [Western Red Cedar]
Tsuga heterophylla [Western Hemlock]

Broad-leaved (deciduous and evergreen)
Chrysolepis chrysophylla [Golden Chinkapin] (may also be shrubby)
Populus trichocarpa [Black Poplar]

Native Oregon Trees - 75-100 ft (23-30 m) high

Needle- or scale-leaved (conifers)
Calocedrus decurrens [Incense Cedar]
Chamaecyparis nootkatensis [Alaska Cedar, Yellow Cedar] (syn. Xanthocyparis nootkatensis)
Tsuga mertansiana [Mountain Hemlock]

Broad-leaved (deciduous and evergreen)
Acer macrophyllum [Bigleaf Maple]
Arbutus menziesii [Pacific Madrone]

Native Oregon Trees - 50-75 ft (15-23 m) high
Needle- or scale-leaved (conifers)
Abies lasiocarpa [Subalpine Fir, Rocky Mountain Fir]

Broad-leaved (deciduous and evergreen)
Alnus rhombifolia [White Alder]
Alnus rubra [Red Alder]
Populus angustifolia [Narrowleaf Cottonwood]

Native Oregon Trees - 30-50 ft (9-15 m) high
Needle- or scale-leaved (conifers)
Taxus brevifolia [Pacific or Western Yew]

Appendix A
Native Plants List

Broad-leaved (deciduous and evergreen)
Cornus nuttallii [Pacific Dogwood]
Rhamnus purshiana [Cascara, Chittam, Cascara Buckthorn]
Salix lasiandra [Pacific Willow]

Native Oregon Trees - 20-30 ft (6-9 m) high

Broad-leaved (deciduous and evergreen)
Acer circinatum [Vine Maple]
Alnus incana ssp. tenuiflolia (syn. Alnus tenuifolia) [Thinleaf Alder, Mountain Alder]
Amelanchier alnifolia [Western or Pacific Serviceberry, Saskatoon Berry]

Native Oregon Shruby Trees/Tall Shrubs - 8-20 ft (2.4-6 m) high

Broad-leaved (deciduous and evergreen)
Ceanothus integerrimus [Deer Brush]
Ceanothus sanquineus [Redstem Ceanothus, Buckbrush, Oregon-tea] --- (info) only
Ceanothus velutinus hookeri [Snowbrush, Tobacco Bush, Cinnamon Bush]
Cornus sericea [Redosier Dogwood]
Corylus cornuta var. californica [Western Hazenut, California Hazelnut]
Crataegus douglasii [Douglas or Black Hawthorn]
Garrya fremontii [Fremont Silktassel]
Holodiscus discolor [Oceanspray]
Lonicera ciliosa [Western Trumpet Honeysuckle]
Lonicera involucrata [Twinberry, Black Twinberry]
Menziesia ferruginia [Rusty Menziesia, Fool's Huckleberry, False Azalea]
Myrica californica [Pacific Waxmyrtle]
Oemleria cerasiformis [Indian Plum]
Philadelphus lewisii [Wild Mockorange, Lewis Mockorange]
Physocarpus capitatus [Ninebark, Western Ninebark]
Rhododendron macrophyllum [Pacific Rhododendron]
Rhododendron occidentale [Western Azalea]
Ribes sanguineum [Flowering Currant]
Rubus spectabilis [Salmonberry]
Sambucus caerulea [Blue Elderberry]
Sambucus racemosa [Red Elderberry]
Sorbus scopulina [Greene Mountain-ash, Western Mountain-ash]
Sorbus sitchensis [Sika Mountain-ash]
Vaccinium ovatum [Box Huckleberry, Evergreen Huckleberry]
Vaccinium parvifolium [Red Huckleberry]

Appendix A
Native Plants List

Viburnum edule [Mooseberry, Highbush Cranberry]
Viburnum ellipticum [Oregon Viburnum, Western Wayfaring Tree]

Native Oregon Large Shrubs - 5-8 ft (1.5-2.4 m) high

Needle- or scale-leaved (conifers)
Juniperus communis [Common Juniper] (dry sites)
Broad-leaved (deciduous and evergreen)
Arctostaphylos columbiana [Hairy Manzanita] (acid soils, symbiotic with salal)
Arctostaphylos patula [Green Manzanita, Greenleaf Manzanita,] (dry sites)
Mahonia aquifolium (syn. Berberis aquifolium) [Oregon Grape]
Ceanothus cuneatus [Narrowleaf Buckbrush, Wedgeleaf Ceanothus, Greasewood] Chrysothamnus nauseosus [Gray Rabbitbrush] (dry sites)
Gaultheria shallon [Salal]
Myrica gale [Sweetgale, Bog Myrtle] (dry sites)
Physocarpus malvaceus [Mallow Ninebark] (dry sites)
Purshia tridentata [Bitterbrush, Antelope Bush] (dry sites)
Rhamnus californica [California Buckthorn, California Coffeeberry] (dry sites)
Rhus trilobata [Skunkbush Sumac] (dry sites)
Ribes aureum [Golden Currant]
Ribes cereum [Wax Currant] (dry sites)
Ribes divaricatum [Coast Black Gooseberry]
Rosa nutkana [Common Wild Rose, Nootka Rose] (dry sites)
Rubus leucodermis [Western Raspberry, Blackcap] (dry sites) (seasonal flooding)
Rubus parviflorus [Thimbleberry] (moist to dry)
Shepherdia canadensis [Russet Buffaloberry, Soapberry] (dry sites)
Symphoricarpos albus [Common Snowberry]

Native Oregon Medium Shrubs - 3-5 ft (0.9-1.5 m) high

Broad-leaved (deciduous and evergreen)
Chrysothamnus viscidiflorus [Green Rabbitbrush] (dry sites)
Potentilla fruticosa [Bush Cinquefoil]
Quercus garryana var. breweri [Brewer's Oak]
Ribes nevadense [Mountain Pink/Sierra Currant] (dry sites) (seasonal flooding)
Rosa woodsii [Woods' Rose] (dry sites)
Spiraea douglasii [Douglas Spirea, Western Spirea] (wet sites)
Vaccinium membranaceum [Big, Mountain, or Blue Huckleberry]

Native Oregon Small Shrubs - 18 inches - 3 ft (45-90 cm) high

Appendix A
Native Plants List

Broad-leaved (deciduous and evergreen)
Arctostaphylos uva-ursi [Kinnikinick, Bearberry]
Ledum glandulosum [Pacific Labrador-tea] (wetland-riparian)
Mahonia nervosa [Longleaf Mahonia]
Paxistima myrtifola [Oregon Boxwood, Mountain Lover]
Spiraea betulifolia [Shiny-leaf, White, or Birchleaf Spirea] --- (info) only
Spiraea densiflora [Mountain Spirea]
Symphoricarpos mollis [Creeping or Spreading Snowberry] (bank stabilizer)
Rubus ursinus [Trailing Blackberry] (pioneer species)

Native Oregon Low Growing Shrubs - less than 18 inches (45 cm) high

Broad-leaved (deciduous and evergreen)
Cornus Canadensis [Bunchberry]
Ceanothus prostratus [Squawcarpet, Hahale Mat] (bank stabilizer)
Fragaria chiloensis [Sand, Beach or Chilean Strawberry] (bank stabilizer)
Linnaea borealis [Twin-flower]
Mahonia repens (syn. Berberis repens) [Creeping Mahonia]
Oxalis oregona [Oregon Oxalis]
Vancouveria hexandra [Northern Inside-out Flower]
Vancouveria planipetala [Small Inside-out Flower]

Native Oregon Grasses, Rushes, and Sedges- 18 inches – 3 feet (45-90 cm) high

Armeria maritime [Sea Thrift]
Carex barbarae [Santa Barbara Sedge]
Carex obnupta [Slough Sedge] (erosion control)
Carex tumulicola [Berkeley Sedge]
Deschampsia caespitosa [Tufted Hair Grass]
Elymus glaucus [Blue Wild Rye]
Festuca californica [California Fescue] (drought tolerant)
Festuca idahoensis [Idaho Fescue] (drought tolerant)
Festuca roemeri [Roemer's Fescue] (drought tolerant)
Juncus effuses [Common Rush]
Scirpus microcarpus [Small Flowered Bulrush]

Appendix A
Native Plants List

Native Oregon Perennials- 18 inches – 3 feet (45-90 cm) high
Achillea millefolium [Common Yarrow]
Alisma plantago-aquatica [Water Plaintain]
Antennaria argentea [Silver Pussytoes] Drought tolerant.
Aquilegia Formosa [Red Columbine]
Arctostaphylos uva-ursi [Kinnikinnick]
Asarum caudatum [Wild Ginger]
Aster subspicatus [Douglas Aster]

Balsamorhiza sagittata [Arrowleaf Balsamroot]
Blechnum spicant [Deer Fern]
Camassia quamash [Common Camas]
Ceanothus prostrates [Prostrate Ceanothus]
Cornus Canadensis [Bunchberry]
Dicentra Formosa [Western Bleeding Heart]
Dodecatheon hendersonii [Henderson's ShootingStar]
Dryas octopetala [Mountain Avens]
Erigeron glaucus [Seaside Daisy]
Erigeron speciosus [Showy Fleabane] (drought tolerant)
Eriogonum umbellatum [Sulphur Flower] (drought tolerant)
Eriophyllum lanatum [Oregon Sunshine]
Erythronium oregonum [White Fawn Lily]
Eschscholzia californica [California Poppy] (drought tolerant)
Fragaria chiloensis [Wild Strawberry] (drought tolerant)
Fragaria vesca [Wood Strawberry] (drought tolerant)
Fragaria virginiana [Wild Strawberry] (drought tolerant)
Gaultheria ovatifoia [Oregon Wintergreen] (drought tolerant)
Gilia capitata [Bluehead Gilia] (drought tolerant)
Helenium hoopesii [Orange Sneezeweed] (drought tolerant)
Heuchera micrantha [Alum Root]
Iris dougasiana [Douglas Iris]
Iris tenax [Oreogn Iris]
Ligustichum apifolium [Parsley-leaf Lovage]
Lupinus vivularis [Stream-bank Lupine]
Lysichton armericanum [Skunk Cabbage] (needs wet soil)
Maianthemum dilatatum [False Lily of the Valley] (spreads)
Mimulus guttatus [Yellow Monkey Flower]
Nuphar palysepalum [Spatterdock]
Oxalis oregana [Wood Sorrel]
Penstemon richardsonii [Richardson's Penstamon]
Penstemon serrulatus [Cascade Penstemon]
Petasites palmatus [Coltsfoot] (spreads)

Appendix A
Native Plants List

Phlox diffusa [Spreading Phlox]
Polemonium pulcherimum [Jacob's Ladder]
Polypodium glycyrrhiza [Licorice Fern]
Potentilla pacifica [Pacific Silverweek] (groundcover)
Sagittaria latifolia [Wapato]
Saxifraga rufidula [Rusty-hair Saxifrage]
Sedum lanceolatum [Stonecrop]
Sedum oreganum [Oregon Stonecrop]
Sedum spathulifolium [Stonecrop]

Sidalcea campestris [Meadow-Checkermallow]
Sisyrinchium bellum [Blue-eyed Grass]
Sisyrinchium californicum [Yellow-eyed Grass]
Sisyrinchium douglasii [Grass Widow]
Smilacina racemosa [False Solomon's Seal}
Solidago Canadensis [Goldenrod]
Synthyris reniformis [Spring Queen]
Tellima grandiflora [Fringe Cup]
Thalictrum occidentale [Western Meadow Rue]
Tolmiea menziesii [Piggyback Plant]
Trillium ovatum [Trillium]
Typha latifolia [Cattails] (think clumps)
Vancouveria hexandra [Inside-out Flower]
Viola adunca [Early Blue Violet]
Woodwardia fimbriata [Giant Chain Fern]

Appendix B
Trail Construction Specifications

http://www.fhwa.dot.gov/environment/fspubs/00232839/page05.htm

The Trailbed
On hillside trails, the trailbed is excavated into the side of the hill to provide a slightly out-sloped travel path. Depending on the slope of the hill, the amount of excavation and the use of the excavated material varies (Figure 10).

On steep slopes, full-bench construction is usually needed. Soil excavated from the hill is cast aside as far as possible from the trail and not used at all in the fillslope. Especially on steep slopes, relying on fill for part of the trailbed is a bad idea. This soft material is likely to erode away quickly, creating dangerous soft spots on the downhill edge of the trail. If fill is used, it often needs to be reinforced with expensive crib or retaining walls. As the slope of the hillside decreases, it becomes more feasible to use fill material as part of the trailbed. However, even though it requires more hillside excavation, full-bench trailbeds will generally be more durable and require less maintenance than partial bench construction. There is a tradeoff, though. Full-bench construction is often more costly because more excavation is needed, and it also results in a larger backslope. Most trail professionals will usually prefer full-bench construction.
Constructing Sidehill Trails

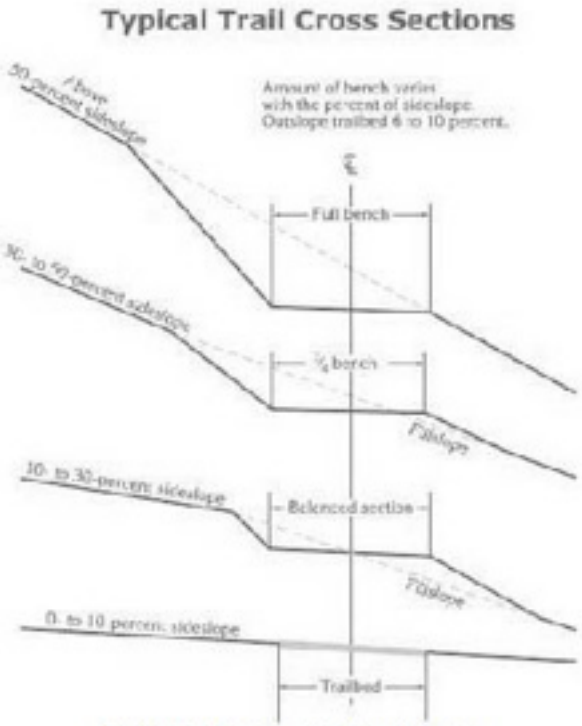


Figure 10--Typical trailway cross sections. Full-bench construction will give you the fewest problems--especially on steep slopes

Appendix C

DETROIT FLATS BIRD LIST

This checklist includes all bird species that have been observed or detected at Detroit Flats, in the town of Detroit or on Detroit and Big Cliff Reservoirs. The information has been compiled by Steve Dowlan from records from Willamette National Forest, Salem Audubon Society and Oregon birders On-Line.

Codes for likelihood of observation and seasonal occurrence are described below:

Observation Codes
1 = Easy to find throughout the season
2 = Usually easy to find, but may be for a brief period or in small numbers
3 = Usually hard to find due to small numbers or secretive habits
4 = Not easy to find, not seen every year
5 = Seen fewer than 5 times for all seasons
Seasons of Occurrence
Spring = March - May
Summer = June - August
Fall = September - November
Winter = December - February
Location Code
DF = Detroit Flats
DL = Detroit Lake
BC = Big Cliff Reservoir
DT = Around the town of Detroit

Bird Species	Spring	Summer	Fall	Winter	Notes
LOONS					
Pacific Loon			5		DL
Common Loon	3	5	3	3	DL
GREBES					
Red-necked Grebe	5				DF
Pied-billed Grebe	3	3	3	4	DF, DL,BC
Horned Grebe	3		3	3	DL
Western Grebe	3		3	3	DL
Clark's Grebe				5	DL
CORMORANTS					
Double-crested Cormorant	4		4	4	DF,DL,BC
HERONS, EGRETS & BITTERNS					
Great Blue Heron	3	3	3	3	DF,DL,BC
Great Egret		5			DF
Green Heron	4	3	4		DF
SWANS, GEESE & DUCKS					
Trumpeter Swan	5				DF
Gr. White-fronted Goose	4		4		DF
Canada Goose	1	1	1	1	DF,DL
Wood Duck	3	3	3	4	DF
Green-winged Teal	1		2	4	DF
Mallard	1	1	1	1	DF, DL
Northern Pintail	2		2	4	DF
Cinnamon Teal	2	3	4		DF
Northern Shoveler	2		2	4	DF
Gadwall	3				DF
American Wigeon	1		1	4	DF,DL,BC
Canvasback	4		4	4	DF,DL
Ring-necked Duck	3		3	4	DF,DL,BC

Appendix C
Detroit Flats Brids List

Greater Scaup	5				DL,BC
Lesser Scaup	3		3	4	DF,DL
Harlequin Duck					DL
Long-tailed Duck			5	5	DL,BC
Common Goldeneye	2		2	2	DL,BC
Barrow's Goldeneye	4		2	2	DL,BC
Bufflehead	1	4	1	1	DL,BC
Common Merganser	1	1	1	1	DF,DL,BC
Red-breasted Merganser			5		DL
Hooded Merganser	1	3	1	1	DF,DL
Ruddy Duck	3				DF,DL
VULTURES					
Turkey Vulture	1	1	1		DF,DL
OSPREY					
Osprey	1	1	1		DF,DL,BC
HAWKS & FALCONS					
Bald Eagle	3	3	3	3	DF,DL
Northern Harrier	4		4		DF
Sharp-shinned Hawk	3	4	3	4	DF
Cooper's Hawk	3	4	3	4	DF
Red-shouldered Hawk	5		5		DF
Red-tailed Hawk	3	3	3	3	DF
Golden Eagle	5		5		DF
American Kestrel	4		4		DF
Merlin	4		4		DF
Peregrine Falcon	4		4		DF,DL
GROUSE and QUAIL					
Ruffed Grouse	4				DF
Mountain Quail	3	3	3		DF
RAILS					
Virginia Rail	5				DF
Sora	5				DF
American Coot	1	2	2	4	DF,DL
PLOVERS					
Killdeer	1	4	2	4	DF
CRANES					
Sandhill Crane	5				DF
SANDPIPERS					
Greater Yellowlegs	4		4		DF
Spotted Sandpiper	3	3	3		DF,DL,BC
Long-billed Curlew	5				DF
Western Sandpiper	4		4		DF
Least Sandpiper	3		3		DF
Pectoral Sandpiper			5		DF
Long-billed Dowitcher	4		4		DF
Common Snipe	3		3	4	DF
GULLS					
Bonaparte's Gull	5				DF,DL
Mew Gull	5				DL
Ring-billed Gull	3		3	3	DF,DL
California Gull	2		2	1	DL
TERNS					
Caspian Tern	4	4	4		DF,DL
PIGEONS & DOVES					
Band-tailed Pigeon	3	3	3		DF,DT
Mourning Dove	3		3		DF,DT
OWLS					
Northern Pygmy Owl			3		DF
Long-eared Owl	5				DF
Short-eared Owl	5				DF
NIGHTJARS					
Common Nighthawk		1	1		DF
Common Poorwill	5				DF
SWIFTS					
Black Swift	5				DF
Vaux's Swift	1	3	3		DF,DT

Appendix C
Detroit Flats Brids List

HUMMINGBIRD					
Calliope Hummingbird	4				DF
Rufous Hummingbird	1	1	2		DF,DT
KINGFISHER					
Belted Kingfisher	2	2	2	2	DF,DL,BC
WOODPECKERS					
Lewis' Woodpecker	5				DF
Red-breasted Sapsucker	3	3	3		DF,DT
Downy Woodpecker	3	3	3	3	DF,DT
Hairy Woodpecker	3	4	3	3	DF
Northern Flicker	1	1	1	1	DF,DT
Pileated Woodpecker	3	3	3	3	DF
FLYCATCHERS					
Western Wood-Pewee	2	2	3		DF
Willow Flycatcher	2	1	2		DF
Hammond's Flycatcher	3	3	3		DF,DT
Dusky Flycatcher	2				DF,DT
Gray Flycatcher	2				DF
Pacific-slope Flycatcher	3	1	3		DF,DT
Say's Phoebe	4				DF
Ash-throated Flycatcher	5	5			DF
Western Kingbird	4				DF,DT
Eastern Kingbird		5			DF
Horned Lark	4			4	DF
SWALLOWS					
Tree Swallow	1	1	1		DF,DT
Violet-green Swallow	1	1	1		DF,DT
N. Rough-winged Swallow	2	3	3		DF,DT
Bank Swallow		5			DF
Cliff Swallow	3	3	3		DF,DT
Barn Swallow	1	1	1		DF,DT
CORVIDS					
Stellar's Jay	1	1	1	1	DF,DT
American Crow	1	1	1	1	DF,DT
Common Raven	3	3	3	3	DF,DT
CHICKADEES					
Mountain Chickadee				5	DF
Chestnut-backed Chickadee	1	1	1	1	DF,DT
Bushtit	3			3	DF,DT
Brown Creeper	3	3	3	3	DF
NUTHATCHES					
Red-breasted Nuthatch	3	3	3	3	DF,DT
WRENS					
Marsh Wren	3		3		DF
House Wren	2		2		DF
Winter Wren	1	1	1	1	DF,DT
KINGLETS					
Golden-crowned Kinglet	1	1	1	1	DF,DT
Ruby-crowned Kinglet	1		1	4	DF,DT
THRUSHES					
Western Bluebird	4		4	4	DF
Mountain Bluebird	5				DF
Townsend's Solitaire	5				DF
Swainson's Thrush	1	2	3		DF,DT
Hermit Thrush	3		3		DF,DT
American Robin	1	1	1	1	DF,DT
Varied Thrush	2	4	1	1	DF,DT
THRASHERS					
Northern Mockingbird		5			DF
Sage Thrasher	5(1)				DF
PIPITS					
American Pipit	3		3	3	DF
WAXWINGS					
Cedar Waxwing	3	1	3		DF,DT
SHRIKE					

Appendix C
Detroit Flats Brids List

Northern Shrike	5			5	DF
Loggerhead Shrike	4				DF
STARLING					
European Starling	1	1	1	1	DF,DT
VIREOS					
Cassin's Vireo	3	3	3		DF
Warbling Vireo	1	1	2		DF,DT
WARBLERS					
Orange-crowned Warbler	1	1	2		DF,DT
Nashville Warbler	2				DF,DT
Yellow Warbler	2	1	3		DF,DT
Yellow-rumped Warbler	1		1	2	DF,DT
Black-thrtd Gray Warbler	2	2	3		DF,DT
Hermit Warbler	2	1	3		DF
Townsend's Warbler	5		5	5	DF,DT
American Redstart	5	5			DF
MacGillivray's Warbler	3	3	3		DF,DT
Common Yellowthroat	1	1	1		DF
Wilson's Warbler	1	1	2		DF,DT
Yellow-breasted Chat	5				DF
TANAGERS					
Western Tanager	3	3	3		DF,DT
FINCHES, GROSBEAKS & SPARROWS					
Black-headed Grosbeak	1	1			DF,DT
Lazuli Bunting	5				DF
Spotted Towhee	1	1	1	1	DF,DT
Sage Sparrow	5				DF
Grasshopper Sparrow	5				DF
Chipping Sparrow	2		2		DF,DT
Brewer's Sparrow	4				DF
Vesper Sparrow	3		3		DF
Black-throated Sparrow	5				DF
Savannah Sparrow	1		1	4	DF
Fox Sparrow	1		1	2	DF,DT
Lincoln's Sparrow	1		2	4	DF
Song Sparrow	1	1	1	1	DF,DT
Swamp Sparrow	5				DF
White-throated Sparrow	5				DF
White-crowned Sparrow	1	1	1	4	DF,DT
Golden-crowned Sparrow	1		1	4	DF,DT
Dark-eyed (Oregon) Junco	1	1	1	1	DF,DT
Red-winged Blackbird	1	1	1	1	DF,DT
Western Meadowlark	2		2	4	DF
Yellow-headed Blackbird	5		5		DF
Brewer's Blackbird	1	1	1	1	DF,DT
Brown-headed Cowbird	2				DF,DT
Bullock's Oriole	3	3			DF,DT
Purple Finch	2	2	2	2	DF,DT
Cassin's Finch	5				DF
House Finch	2	2	2	2	DF,DT
Red Crossbill	4	4	4	4	DF,DT
Pine Siskin	1	1	1	1	DF,DT
Lesser Goldfinch	5		5		DF,DT
American Goldfinch	3		3	4	DF,DT
Common Redpoll			5		DF
Evening Grosbeak	4	4	4	4	DF,DT
WEAVER FINCHES					
House Sparrow	2	2	2	2	DT