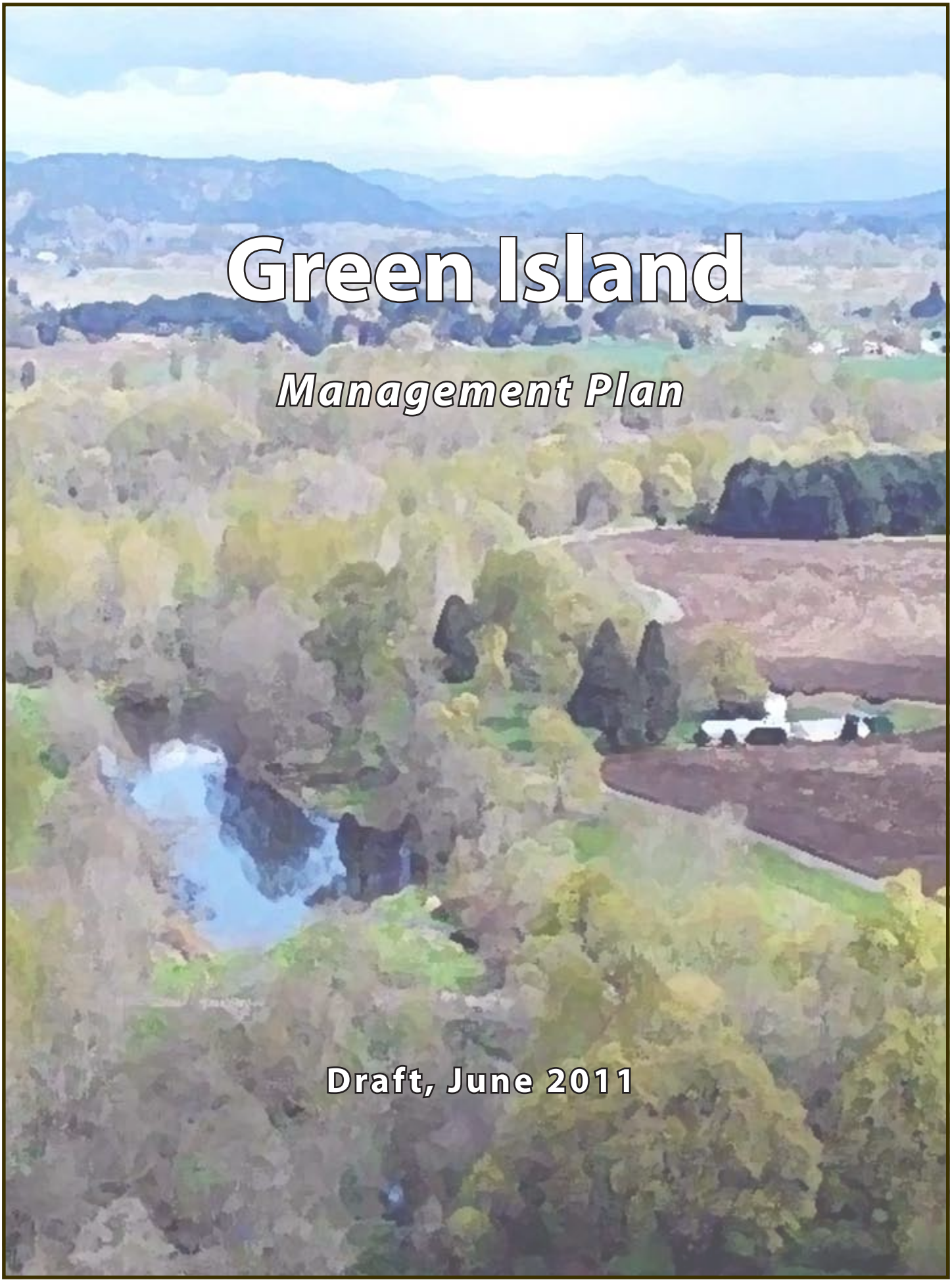

Green Island

Management Plan

Draft, June 2011

Green Island Partners

The Green Island project has benefited greatly from a broad partnership of agencies, organizations, and individuals from the start including:

- McKenzie River Trust
- The Green Family
- Oregon Watershed Enhancement Board
- Bonneville Power Administration
- Eugene Water and Electric Board
- US Fish and Wildlife Service
- Oregon Department of Fish and Wildlife
- Meyer Memorial Trust
- Pacific Salmon Commission
- BellaVista Foundation
- Natural Resource Conservation Service
- National Fish and Wildlife Foundation
- Trout Unlimited – Chapter 678
- U.S. Environmental Protection Agency
- Oregon Department of Geology and Mineral Industries
- Caddis Fly Angling Shop
- McKenzie Watershed Council
- East Lane Soil and Water Conservation District
- Oregon Division of State Lands
- Oregon Parks and Recreation Department
- US Department of Interior - Bureau of Land Management
- US Army Corps of Engineers
- Lane Council of Governments
- City of Eugene
- Lane County Board of Commissioners
- Congressman Peter DeFazio
- Delta Sand & Gravel
- Wildish Land Company
- Lane County Audubon
- McKenzie-Willamette Confluence Project Committee
- McKenzie Flyfishers
- Native Plant Society of Oregon, Emerald Chapter
- Raptor Views
- Headwaters Photographic
- University of Oregon
- Oregon State University

Green Island

MANAGEMENT PLAN

McKenzie River Trust
1245 Pearl Street
Eugene, Oregon 97401
www.mckenzieriver.org

Prepared by
Lane Council of Governments
859 Willamette Street, Suite 500
Eugene, Oregon 97401
www.lcog.org

Draft, June 2011

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Appendices

1.0 Introduction and Background

1.1 Introduction

Green Island is located approximately two miles to the west of Coburg, Oregon, just below the confluence of the McKenzie and the Willamette Rivers and is owned and managed by the McKenzie River Trust (MRT). The initial acquisition at Green Island was finalized in 2003 when MRT purchased 865 acres from the Green family, who had owned and farmed the land for over 70 years. Subsequent acquisitions have since expanded MRT ownership on and around Green Island to over one thousand acres. MRT is dedicated to preserving and restoring this dynamic and ecologically diverse site and has completed significant restoration and management actions since the initial acquisition.

The purpose of this management plan is to document historic and existing site conditions, describe a vision for the desired future condition, and provide detailed direction for short- and long-term management and restoration of the site's habitats and facilities. The Management Plan is consistent with requirements stipulated by Bonneville Power Administration (BPA) and Oregon Watershed Enhancement Board (OWEB) under funding and conservation easement agreements and is a revision of the *Interim Green Island Management Plan* (2005, revised in 2009).

1.2 Site Overview and Regional Context

Green Island is situated within the highly dynamic confluence area of the McKenzie and Willamette Rivers, located just to the north of Eugene, Oregon. For thousands of years, the Willamette River and its tributaries freely meandered through the flat valley bottom on and around Green Island, changing course on a frequent basis, regularly inundating the river's vast floodplain including the McKenzie River confluence area as well as much of what is now Eugene and Springfield. These high water events shaped the landscape and deposited thick layers of rich agricultural soils and gravels. This dynamic river system created abundant aquatic habitat by continuously carving new side channels,

Format and Organization
The Green Island Management Plan is organized into six general sections:

Section 1.0: Introduction and Background

Section 2.0: Site History and Existing Conditions

Section 3.0: Issues and Opportunities

Section 4.0: Desired Future Condition

Section 5.0: Goals, Objectives, and Indicators

Section 6.0: Implementation Priorities

Green Island and vicinity, with historic McKenzie River channel in foreground

Photo by Raptor Views

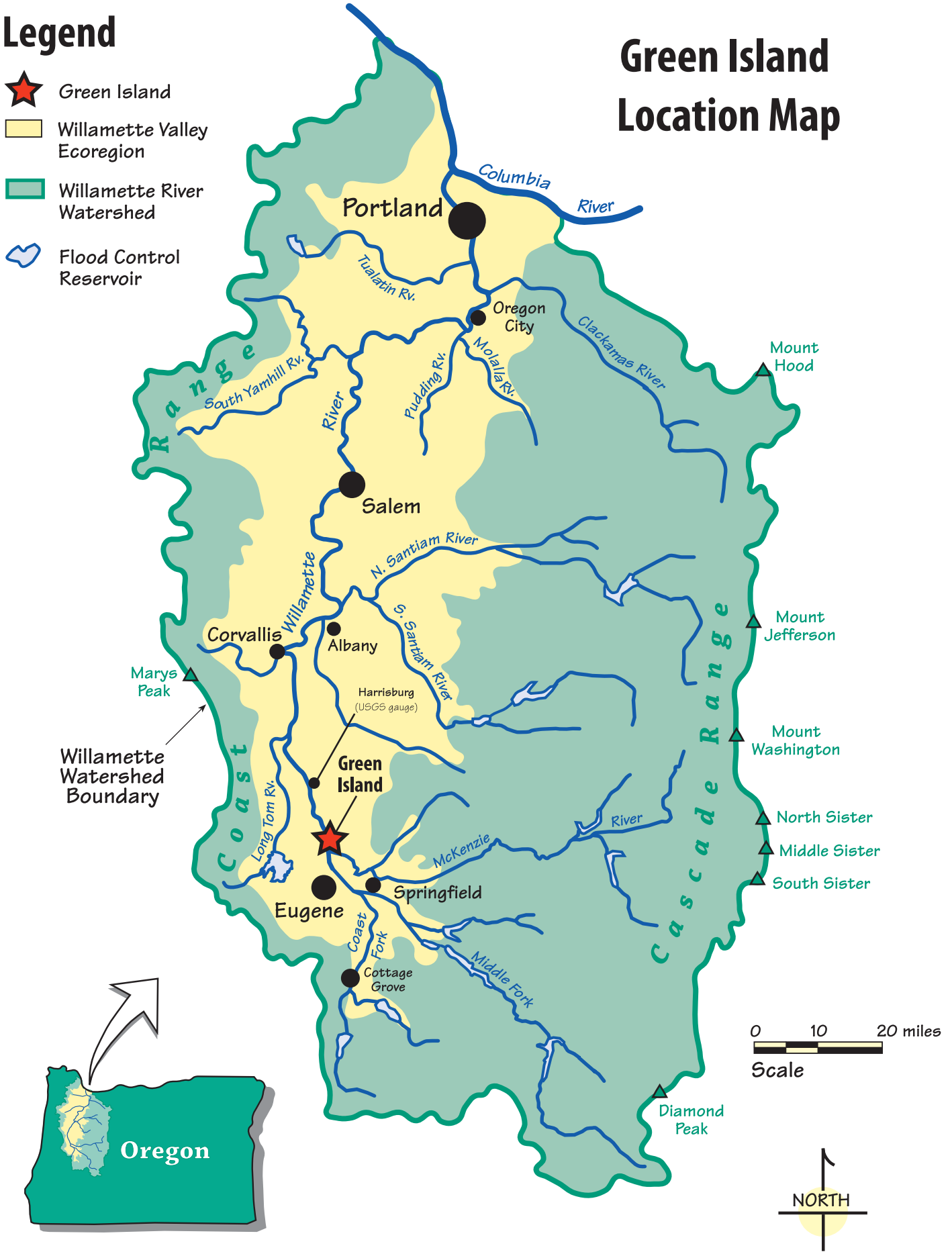

Legend
Green Island
Willamette Valley Ecoregion
Willamette River Watershed
Flood Control Reservoir
Green Island Location Map
Columbia River
Portland
Tualatin Rv.
Oregon City
Clackamas River
Mount Hood
Coast Range
South Yamhill Rv.
River
Pudding Rv.
Molalla Rv.
Salem
N. Santiam River
Willamette
S. Santiam River
Corvallis
Albany
Mount Jefferson
Marys Peak
Harrisburg
(USGS gauge)
Willamette Watershed Boundary
Green Island
Long Tom Rv.
Cascade Range
River
McKenzie
Mount Washington
North Sister
Middle Sister
South Sister
Springfield
Eugene
Coast Fork
Middle Fork
Cottage Grove
Diamond Peak
0 10 20 miles
Scale
Oregon
NORTH

Photo by Raptor Views

Green Island, looking northward down the Willamette Valley

building sheltered alcoves, creating pools, toppling trees, and pushing sediment downstream.

Over the past 150 years, the Willamette River system has been transformed into a much less complex system with a deeper, straighter, and narrower channel, and flows have been regulated by a number of dams in the upper watershed. The modifications resulted in a complex web of unintended secondary changes that have fundamentally altered the river system's natural ecological processes and function (Oregon Conservation Strategy, 2006). For example, channel complexity from the confluence area downstream to Harrisburg, about 12 miles, has been reduced by an estimated 80% from historic levels (Dykaar & Wigington, 1998).

Green Island, now owned and managed by the McKenzie River Trust (MRT), along with the adjacent confluence area, presents one of the best remaining opportunities within the Willamette Valley for preserving and restoring this dynamic and ecologically diverse river system (*Willamette Valley-Puget Trough-Georgia Basin Ecoregional Assessment*, 2004). This area was also identified as the most critical area for protection and restoration within the lower McKenzie Watershed (McKenzie Watershed Council, 2000). The confluence area contains some of the least altered fish and wildlife habitat in the Willamette Valley (Confluence Project Steering Committee, 2000) and provides essential habitat for numerous aquatic and terrestrial species, including several federally- and state-listed threatened and endangered species such as spring Chinook salmon, bull trout, Oregon chub, Western pond turtle, and red-legged frog. Since the initial acquisition of Green Island in 2003, MRT has established a set of restoration objectives and has begun implementing large scale habitat and floodplain restoration efforts on the site including extensive tree planting, levee removal, invasive species control, and placement of habitat features. Several studies are planned or underway to help better understand the complex interaction of the site's hydrology and potential for further re-establishment of a more dynamic floodplain.

Photo by Tim Giraudier

A Lincoln's Sparrow utilizes a browse protection stake

1.3 *The Green Island Vision*

The Green Island Vision (below) was created as a component of the *Interim Management Plan* (2005) to provide a vivid picture of the desired future condition for the site. The *Green Island Technical Team* carefully crafted this vision to be consistent with the parameters specified in the MOU between BPA and MRT (Section 4.1). The Technical Team also developed a set of guiding principles, which were intended to complement the vision and help direct future management approaches and decisions (see Section 4.2).

Photo by Raptor Views

Imagine you are on an island formed by the confluence of one of the nation's largest rivers, the Willamette and one of its purest, the McKenzie. Surrounded by enormous cottonwood trees, three feet in diameter, the July sunlight gently filters through the canopy overhead to the cool forest floor below. As you make your way to the forest's edge through the dense understory of shrubs and emerge from the cottonwood, maple and alder into a prairie opening, birdsong is everywhere. Evidence of human disturbance is fading. Signs of the island's many forms of wildlife are abundant. Deer bound away, quail take flight, mink, otter and pond turtles all disappear in a wet departure into one of the many small channels that surround the opening. Following their wake you see the dark shape of dozens of small fish quickly seeking the shelter of the shade in the otherwise crystal clear water.

Overhead, a dragonfly hunts mosquitoes and mayflies, and across the channel and its gravel bars, a brilliant yellow and black tiger swallowtail patrols the forest edge in search of a mate. As you leave the opening, and its fading bloom of dozens of native plants and head back into the forest, you must first traverse a giant log jam breaching the channel, evidence of the mighty forces that have helped create this landscape in the winter months. Your transect across the island, from one river channel to the other is frequently interrupted by the island's inhabitants, flushed by your sudden and unexpected presence, and by the maze of channels which seem to belong equally to both rivers. It is difficult to imagine that this land was cleared and farmed for almost a century. It is a privilege to witness this transformation and you silently pay tribute to the many people who have helped restore this land back into a special and diverse habitat.

Our vision for Green Island is to restore a robust ecosystem comprised of a rich mosaic of historic habitat types. We believe that this will be successful if it is done through cooperative partnerships dedicated to innovative, flexible and adaptive management.

1.4 Acquisition History and Ownership

The MRT ownership on Green Island now totals 1,051 acres, and was acquired through several separate transactions beginning in 2003. Within this Management Plan, these acquisitions combined are referred to as *Green Island* or *the site*.

1.4.1 Green Family Property Acquisition

Initial acquisition of the Green Island site was finalized in 2003 when the MRT purchased a total of 865 acres from the Green family, who owned and farmed the land for over 70 years and wanted to see it protected and restored for the benefit of wildlife and the communities of the southern Willamette Valley. MRT utilized a combination of funds awarded through the Oregon Watershed Enhancement Board (OWEB), North American Wetland Conservation Act (NAWCA), and the Eugene Water and Electric Board (EWEB) to purchase the property. The Bonneville Power Administration (BPA) holds a conservation easement on the property, which insures that Green Island is managed in a way that protects natural resources, maintains or enhances air or water quality, and preserves its underlying archaeological or cultural resources in perpetuity. In addition, the State of Oregon, by and through OWEB is a third party beneficiary to this easement.

1.4.2 Bixler Acquisition

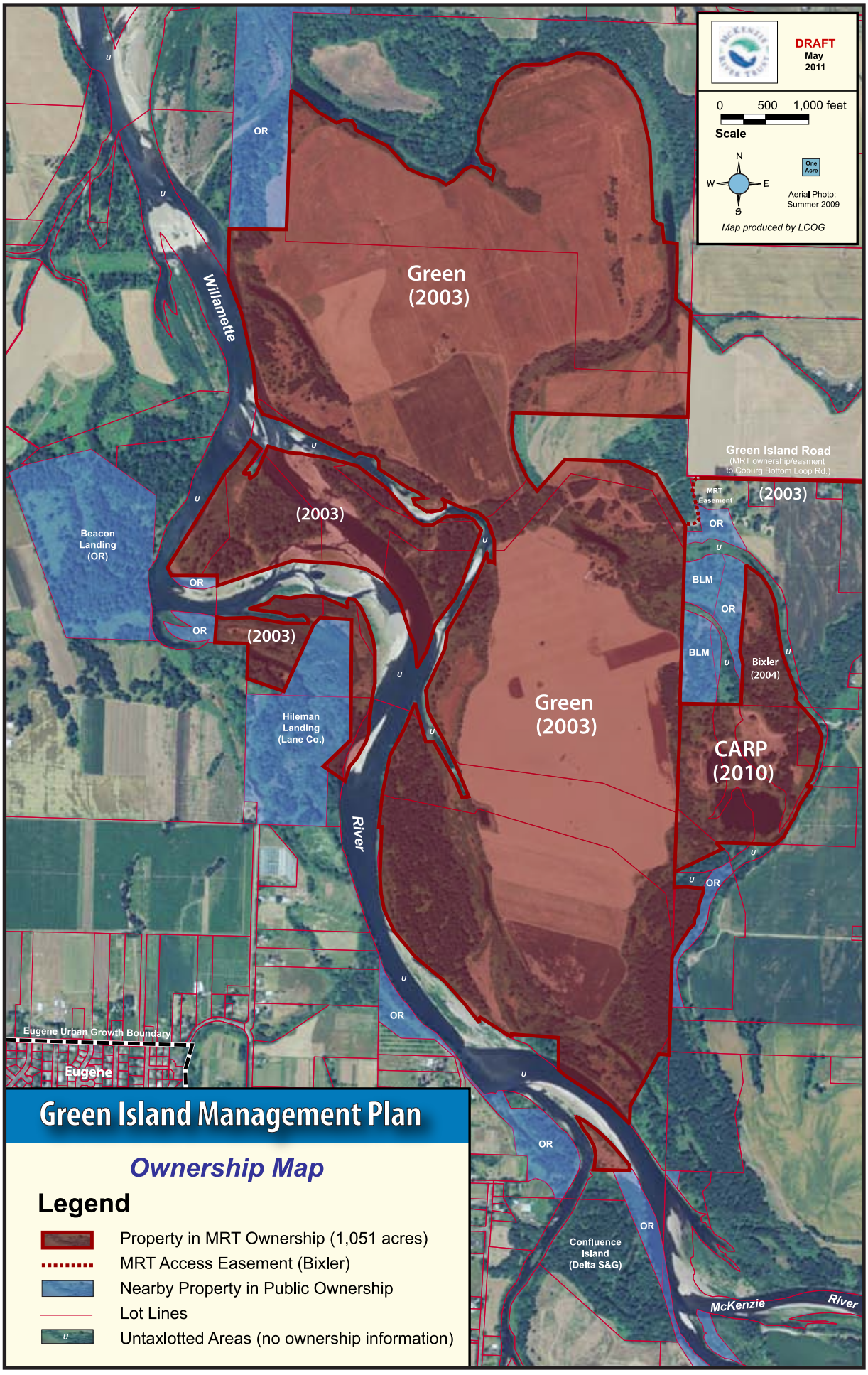
In 2004, 15 acres of historic McKenzie River channel along the eastern edge of Green Island was purchased from the Bixler family. This was a key acquisition as this segment of channel contains delineated Oregon chub habitat.

1.4.3 Coburg Aggregate Reclamation Project (CARP)

In October 2010, the McKenzie River Trust (MRT) made an important addition to the site with the purchase of an additional 56 acres on the west side of Green Island. This acquisition provides an enormous opportunity for the protection and restoration of the historic McKenzie River channel and for further hydrologic connectivity on Green Island. This acquisition occurred after several years of negotiation with the landowner, Doug Melevin. MRT was awarded a grant

Averaging fifteen feet in depth, the ponds at the CARP site encompass thirteen surface acres (photo looking east, May 2011).

Photo by Raptor Views


DRAFT
May
2011
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N
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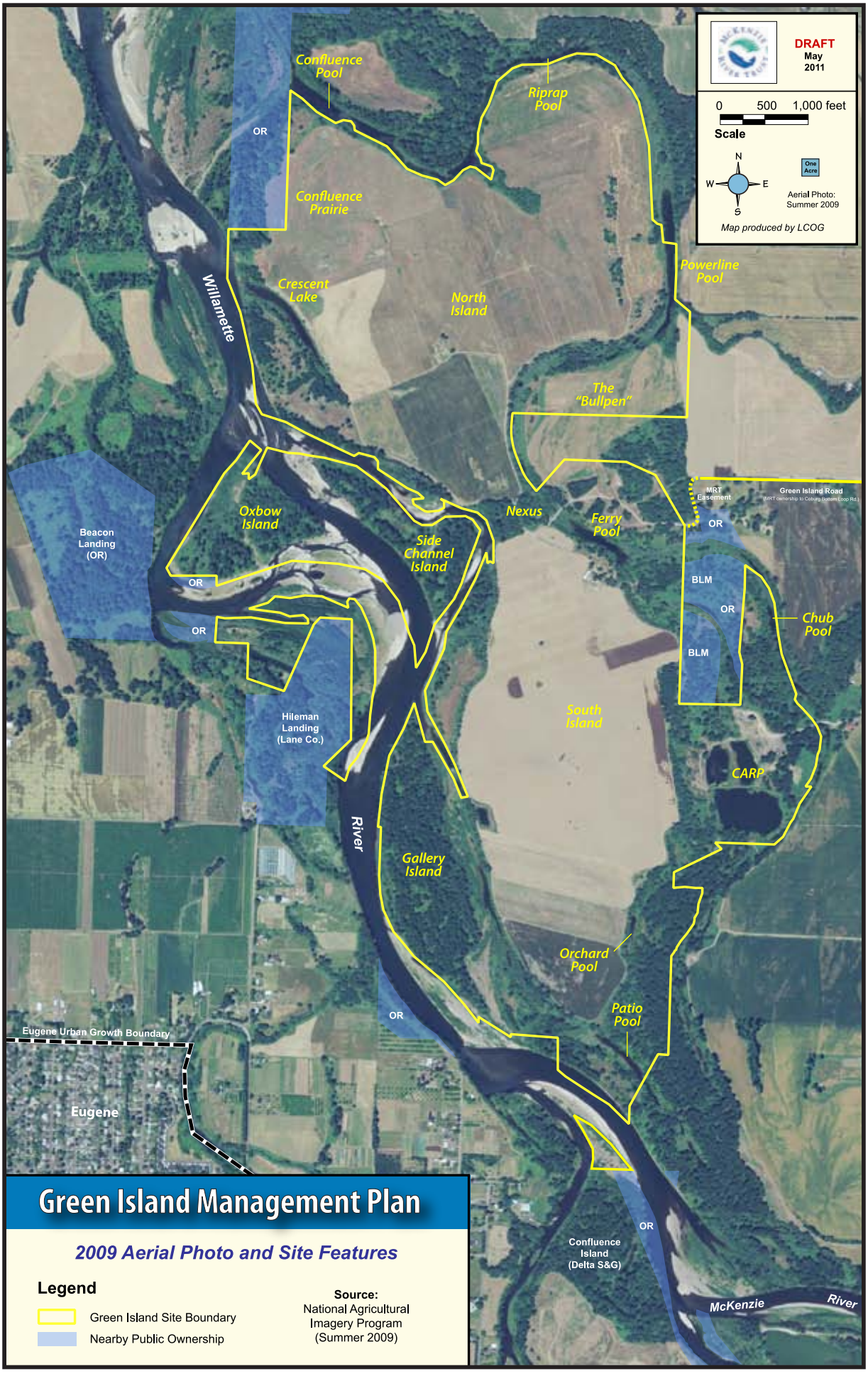
One Acre
Aerial Photo:
Summer 2009
Map produced by LCOG
Green
(2003)
Willamette
River
Green Island Road
(MRT ownership/easment
to Coburg Bottom Loop Rd.)
MRT
Easement
(2003)
OR
BLM
Bixler
(2004)
Beacon
Landing
(OR)
(2003)
Hileman
Landing
(Lane Co.)
Green
(2003)
CARP
(2010)
Confluence
Island
(Delta S&G)
McKenzie
River
Eugene Urban Growth Boundary
Eugene
U
Green Island Management Plan
Ownership Map
Legend
Property in MRT Ownership (1,051 acres)
MRT Access Easement (Bixler)
Nearby Property in Public Ownership
Lot Lines
Untaxlotted Areas (no ownership information)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2011
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One Acre
Aerial Photo:
Summer 2009
Map produced by LCOG
Confluence Pool
Riprap Pool
Confluence Prairie
Crescent Lake
North Island
Powerline Pool
The "Bullpen"
Willamette River
Oxbow Island
Side Channel Island
Nexus
Ferry Pool
MRT Easement
Green Island Road
(MRT ownership to Coburg Bottom Loop Rd.)
Beacon Landing (OR)
OR
BLM
Chub Pool
Hileman Landing (Lane Co.)
South Island
CARP
Gallery Island
Orchard Pool
Patio Pool
Eugene Urban Growth Boundary
Eugene
Confluence Island (Delta S&G)
McKenzie River
Green Island Management Plan
2009 Aerial Photo and Site Features
Legend
Green Island Site Boundary
Nearby Public Ownership
Source:
National Agricultural Imagery Program
(Summer 2009)

by BPA to complete the purchase. BPA holds a conservation easement on this newly acquired piece of property to ensure preservation and management of the property for conservation values in perpetuity. The CARP property was being actively mined for aggregate up to the purchase date and includes several shallow gravel pits and associated haul roads and aggregate piles, along with relatively undisturbed areas of high value side channel and riparian habitat.

1.4.4 Quick Claim Deed Process

MRT has also added another 111 acres to its Green Island holding through numerous small transactions conducted with the State of Oregon through the quick claim deed process.

1.5 Requirements of Funding

As primary funding agencies, both BPA and OWEB have stipulated a set of conditions of management and planning for the site. This Management Plan has been developed to be consistent with these requirements.

1.5.1 Bonneville Power Administration MOA

As described in the Memorandum of Agreement (MOA) between BPA and MRT, a set of post-acquisition requirements for property management planning have been established for the site (Trust-BPA 2010 MOA, Section IV. B.). The Parties presume that management plans will usually guide management of any real property interest that MRT acquires. On a case-by-case basis, if the Parties agree that a particular acquisition does not need a management plan, they will document their decision in writing. Otherwise, management planning should proceed as summarized below:

- BPA to fund and the Trust to Develop, Initial Management Plan: The Initial Management Plans should be completed within 18 months after closing, and provide for management of the property to achieve and maintain the Desired Future Condition. The Trust must develop the Initial Management Plan consistent with BPA's applicable NEPA documents, particularly including BPA's Fish and Wildlife Implementation Plan Final Environmental Impact

Green Island and Willamette River viewed from the south end of the site, looking north

Photo by Raptor Views

Statement and Record of Decision, which includes specific planning steps. [Note: an Interim Management Plan was completed in 2005 and updated in 2009]

- BPA's Right to Approve All Management Plans and Amendments: BPA has the right to review the Initial Management Plan, and any subsequent amendments of the Plan, to ensure conformance with the terms of this agreement, any pertinent procurement contracts or other agreements between the Trust and BPA, and any conservation easement either held by the Trust or the United States.
- BPA to Fund and The Trust to Develop any Amended Management Plan: No later than 10 years after an acquisition, the parties will confer and decide whether an Initial Management Plan needs to be amended.
- Ground Disturbing Activity Prior to Initial Management Plan Approval: Prior to approval of the Initial Management Plan, the Trust shall not undertake any ground-disturbing activities, unless reviewed and approved by BPA in advance or expressly allowed in an easement or other agreement.
- Future Amended Management Plans or Proposals Submitted by Grantor: For conservation easements acquired and held by the Trust, the Trust will notify BPA of any management plans or proposals submitted by the property owner to the Trust that require the Trust's approval.
- Agreement and Easement Controls if Conflict: Parties agree that management plans must follow this MOA and the easement, and will neither impliedly amend nor terminate this Agreement or any easement.

1.5.2 OWEB Management Planning Requirements

OWEB requires the development and implementation of management plans for all properties on which OWEB funds are expended for acquisition of fee title or a conservation easement. The management plan must contain an adequate framework for protection, enhancement, and monitoring of an acquisition's conservation values in a manner consistent with the terms of the conservation easement and the commitments made in the grant application. Management plan must contain certain minimum elements, described below:

- Conservation Values: Provide a statement of the property's conservation values, consistent with the grant application, conservation easement, and baseline documentation.
- Conservation Easement: Provide a recitation of the activities permitted and prohibited by the conservation easement.
- Desired Future Condition: Provide a discussion of the property's desired future condition in the form of goal statements. For each goal statement, present the actions necessary to accomplish the goal and indicate a timeline and the partnerships required for each action.
- Monitoring, Maintenance, and Adaptive Management: Provide a discussion of the monitoring, maintenance, and adaptive management necessary to ensure that proposed actions are successful.
- Educational Activities: Provide a statement of the educational activities planned for the property. At a minimum, the information must include a discussion of why, when, how often, and the partners involved.
- Plan Updates: Provide a brief statement of the process and schedule for management plan updates.
- Maps: Following are maps that must be included in the management plan:
    - Location map
    - Habitat map
    - Restoration map

Photo by Kit Larsen

Chips fly as pileated woodpecker works on nesting cavity

- If applicable, a monitoring map
- If applicable, a property infrastructure map
- If applicable, an allowed-use map

1.6 Conservation Values

As specified in the BPA *Green Island Conservation Easement* (2004), it is the purpose of the easement to retain the conservation values of Green Island by protecting its natural resources, maintaining or enhancing air or water quality, and preserving its underlying archaeological or cultural resources in perpetuity, and preventing any use of Green Island that will impair or interfere with the conservation values of Green Island. The conservation values include the following:

- Anadromous fish and their habitat, including the riparian and upland habitats that affect instream habitat
- Resident fish and wildlife and their habitats
- Historical and cultural resources
- Water quantity and quality including temperature, sediment load, and flow levels

Photo by Tim Giraudier

A Ring-necked Duck finds refuge in the Ferry Pool

1.7 Green Island Conservation Easement

In 2004, MRT and BPA entered into an agreement governing the acquisition of a conservation easement by the United States for Green Island (see Appendix A). Activities permitted and prohibited under this conservation easement are summarized below:

Grantor Shall:

- Preserve and protect the conservation values of the property in perpetuity, preserving the predominantly natural, scenic, historic, forested and open space condition.
- Take all actions necessary to ensure that the Property is used and managed in a manner consistent with the Conservation Values.
- Take all actions necessary to ensure that the Property is not used in violation of the specific use restrictions agreed to in the conservation easement.
- Prepare a proposed Habitat Restoration and Management Plan, and implement an approved Habitat Restoration and Management Plan for the property.

Prohibited Actions: The following activities and uses are strictly prohibited on the property except to the extent permitted in the approved Management Plan:

- Any division, partition, or subdivision.
- Commercial or industrial activities.
- All construction, improvements and/or other man-made modifications such as buildings, structures, fences, roads and parking lots, except for:
  - Fences built for the protection of natural features, wildlife habitat, trees, or vegetation. Fences constructed to control livestock shall be "wildlife friendly" and shall provide opportunity for deer and elk ingress and egress. Fencing to control wildlife damage to sensitive vegetation shall be limited to that which is reasonably required to accomplish such protection.
  - Maintenance of existing roads and buildings, provided such maintenance does not impede accomplishing the Conservation Values of the conservation easement.
  - Other construction, improvements and/or man-made modifications approved in writing by BPA and OWEB, which approval shall not be unreasonably withheld.

- Minor changes that have no material individual or cumulative adverse effect on the Conservation Values of the Property, including, but not limited to, the installation of monitoring equipment, irrigation pumps, or temporary structures required to implement certain restoration or management actions.

- Cutting of native trees or vegetation except for the purpose of noxious weed control, removal of danger trees, removal of obstructions to permitted roads or ways, or managing the Property for its Conservation Values.
- Mining, quarry, or gravel extraction.
- Grading, excavation, or other alteration of the land surface, except minor changes that have no material individual or cumulative adverse effect on the Conservation Values of the Property.
- Dumping or accumulation of waste and unsightly or offensive materials, with the exception of the temporary accumulation of debris material as a result of restoring the property.
- Temporary or permanent alteration of natural water courses, lake shores, wetlands or other water bodies, unless for the purpose of watershed restoration, or to restore access consistent with the Conservation Values, or prevent damage to the Conservation Values.
- Operation of motorized off road vehicles such as snowmobiles, dune buggies, all terrain vehicles or motorcycles, except as may reasonably be used in managing the property consistent with its Conservation Values.
- Shooting of firearms, guns, rifles, for professional or recreational purposes, unless specifically to promote a Conservation Value.
- Placing or maintaining billboards and signs, except signs four feet by five feet or smaller for the purpose of management, identification, trespass control, or educational use, and consistent with Section 3 of this Conservation Easement.
- Boarding or raising domestic, exotic, or farm animals of any type.

Photo by Cary Kerst

Belted Kingfisher

Photo by Jeff Krueger

Ferry Pool, located along the historic McKenzie River channel

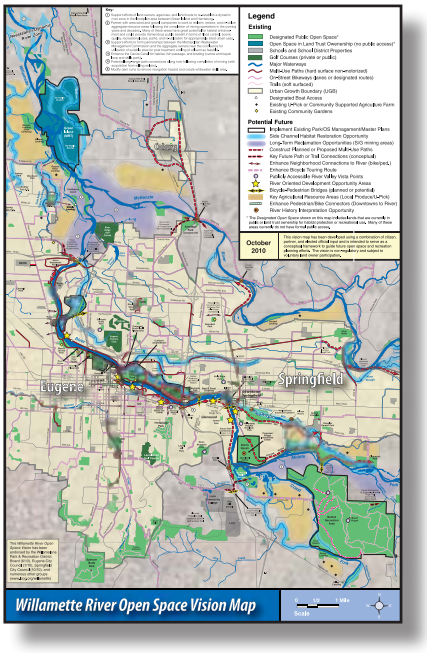
Permitted Uses: The Property may be used for activities consistent with the conservation values enumerated in the conservation easement, but not limited to, education, low-impact recreation, and management activities including, but not limited to, forest management, restoration, research, and native plant propagation.

Zone B (upper agricultural terrace areas) of the property may continue to be used for farm and agricultural production, in accordance with good management practices that do not adversely impact the Conservation Values of Zone A (all non-agricultural portions of the property), for a period not to exceed ten years from July 1, 2004. Subject to the approved Management Plan, Grantor shall be permitted to use pesticides or fertilizers on Zone B in accordance with best agricultural or conservation management practices. Grantor shall also be permitted to use pesticides in Zone A to control noxious weeds in accordance with best conservation management practices. All uses of pesticides and/or fertilizers shall be in accordance with EPA label restrictions and applicable law.

1.8 Related Studies, Reports, Plans, and Planning Efforts

Significant study, planning, and inventory have occurred either at Green Island or in the vicinity and these resources have been incorporated into this management plan as applicable. Key resources include:

- *Technical Report for Water Quality and Fish and Wildlife Habitat* (McKenzie Watershed Council, 1996)
- *Action Plan for Water Quality and Fish and Wildlife* (McKenzie Watershed Council, 1996)
- *McKenzie River Trust's Lower McKenzie Recovery Plan* (McKenzie River Trust, 2000)
- *McKenzie River Subbasin Assessment* (McKenzie Watershed Council, 2000)
- *Willamette Restoration Strategy* (Willamette Restoration Initiative, 2001)
- *Biological Evaluation of the Willamette River and McKenzie River Confluence Area* (Confluence Project Steering Committee, 2001)
- *A Place for Nature – Willamette Basin Habitat Conservation Priorities* (Defenders of Wildlife, 2002)
- *Willamette River Basin Planning Atlas – Trajectories of Environmental and Ecological Change* (Pacific Northwest *Ecosystem Research Consortium*, 2002)
- *Planning for Ecological Stewardship at Green Island* (Ecohydrology West, 2002)
- *Aquatic and Riparian Habitat Assessment for the Eugene-Springfield Area* (MECT, 2002)
- *Rivers to Ridges, Eugene-Springfield Metropolitan Regional Parks and Open Space Vision* (Lane Council of Governments, June 2003)
- *Willamette Valley-Puget Trough-Georgia Basin Ecoregional Assessment* (The Nature Conservancy, 2004)
- *Inventory and Assessment of Vegetation and Restoration and Management Recommendations for Green Island* (Salix Associates, March 2005)
- *Willamette Valley Basin – Challenge of Change* (Marcia Sinclair, 2005)
- *Oregon Conservation Strategy* (Oregon Department of Fish and Wildlife, 2006)
- *Aquatic & Riparian Habitat Evaluation for the McKenzie-Willamette River Confluence* (McKenzie Watershed Council, 2000)
- *Draft Upper Willamette Chinook and Steelhead Recovery Plan* (ODFW, GNRO, and NMFS, 2007)



Green Island is a central feature in the regional Willamette River Open Space Vision (go to www.lcog.org/willamette to view the vision map).

- *Confluence Island: an assessment of current and future opportunities for ecological restoration at the confluence of the McKenzie and Willamette Rivers* (Gregory and Hulse, 2008)
- *Green Island Hydraulic Modeling Technical Report* (DHI Water and Environment, May 2009)
- *Green Island Interim Management Plan* (McKenzie River Trust, May 2005, updated November 2009)
- *Melevin Gravel Pit Ponds Assessment Planning Restoration Alternatives* (River Design Group, March 2010)
- *Addendum to A Phase I Environmental Site Assessment Compiled for the Green Island Property: Melevin Gravel Extraction Property (Omnicon Environmental Management, August 2010)*
- *Willamette River Open Space Vision and Action Plan* (Lane Council of Governments, October 2010)
- *Sustainable Rivers Project* (The Nature Conservancy and U.S. Army Corps of Engineers, Ongoing)

Photo by Tim Giraudier

Young trees planted on former agricultural land on Green Island

1.9 Project Partners and Technical Assistance

The Green Island project has benefited greatly from a broad partnership of agencies, organizations, and individuals from the start (see inside front cover for list of partners). Partners have willingly provided extensive technical assistance, funding for acquisition and restoration, and labor for on-the-ground projects. Most notable, the USFWS (Willamette Valley National Wildlife Refuge Complex) has assisted in the development, planning and implementation of restoration efforts on the site. MRT signed an MOA with USFWS outlining coordination. Additionally, MRT signed a Landowner Agreement for restoration projects under the Oregon Partners for Fish and Wildlife Program administered by the USFWS (2007).

Photo by Tim Giraudier

The Coburg Hills as seen from Green Island

One of the fifty EPA research wells located on Green Island

1.9.1 USFWS Memorandum of Understanding

In 2005, the U.S. Fish and Wildlife Service and MRT entered into an MOU to formalize their mutual interest in protecting and restoring the natural floodplain and associated fish and wildlife habitat located at the Green Island Complex. Under this agreement, both parties accept the basic principle that conservation of fish and wildlife habitat ultimately must focus on the protection, development and management of ecologically functional habitat complexes and systems on both public and private land. The MOU is in effect for 15 years and spells out responsibilities of both parties, mutual responsibilities, and general provisions. In June 2007, USFWS and MRT entered into a second MOU to further define this partnership. This MOU will remain in effect until June 26, 2017 and specifies how the two entities will work cooperatively to accomplish specific restoration activities at Green Island.

1.9.2 USEPA Memorandum of Understanding

In 2008, the U.S. EPA Office of Research and Development entered into a MOU with MRT as part of the EPA's Willamette Ecosystem Services Project. Using 50 shallow research wells installed on Green Island, the EPA seeks to quantify benefits to water quality from enhanced ground water/surface water interaction and carbon sequestration. In September, 2010, the MOU between MRT and EPA was renewed to extend the agreement for two additional years to September 30, 2012.

2.0 Site History and Existing Conditions

2.1 Historical Context

For thousands of years, the Willamette River and its tributaries have flowed from the surrounding mountains of the Coast and Cascade ranges to converge on the flat Willamette Valley bottom, frequently flooding, migrating, and depositing deep layers of rich soils and gravels. Flooding regularly inundated large expanses of the valley bottom including much of what is now Green Island and the nearby cities of Eugene and Springfield. These frequent events not only shaped the landscape, but created abundant aquatic habitat by continuously carving new side channels, building sheltered alcoves, creating pools, toppling trees, and pushing sediment downstream. Countless generations of Native Americans lived in this fertile floodplain along the river, but sadly, by the mid-1800s their population had been decimated by disease. As a result, little is known about the details of how humans interacted with the river on and around Green Island. The river undoubtedly played an important role for the native people for sustenance, travel, and culture.

Oregon Trail emigrants were drawn to the Willamette Valley by the high quality soils, access to abundant water, and the transportation that the river provided. The Willamette River that the first emigrants encountered in our area was much different than today's river. Broad expanses of riparian forest lined much of the river, in some places up to several miles wide. Many side channels, oxbows, sloughs, and islands existed at the time and the river was filled with large quantities of fallen trees and root wads. In many areas, the Willamette and McKenzie rivers flowed in a different location than present day and migrated often. For example, the McKenzie River joined the Willamette several miles further north of its present location. Flooding was frequent and often massive, inundating floodplain forests, washing out bridges, and inundating farms and homes.

Significant modification of the river system began in the mid 1800s as the population in the southern Willamette Valley began to boom. Agricultural uses replaced riparian forests as trees were removed and drain tiles installed, and towns sprang up adjacent to the river. At the same time, the Willamette River was becoming a major transportation route with river boats traveling as far upstream as Eugene. In an effort to improve safety for navigation, massive efforts were undertaken to remove fallen trees, straighten the river, block side channels, and construct wing dams to create a deeper central channel. It is estimated that over 69,000 snags were removed from the Willamette River between 1880 and 1950

Initial Corps Survey Work for the Willamette River above Oregon City (1875)

"The adjacent country is flat...the [Willamette] river bottom is from one to two miles in width...[and] is traversed by sloughs and bayous, large and small; and in times of floods is covered by swiftly-running water to a depth of from 5 to 10 feet."

Government snag boats, which were specially equipped to lift tree trunks out of the water, systematically cleared the Willamette River of hazardous debris for many decades. Although this improved the river for navigation, loss of the woody debris from the river system had a negative effect on aquatic habitat. (Photo taken between 1880 and 1915 near Eugene).

Corps survey, 2 miles below Corvallis on upriver for 13 miles, after the 1890 flood:

During extreme high water the whole valley, with the exception of a few isolated patches, is overflowed. The least distance between banks... within the limits of the survey is two and one-half miles. The high bank opposite Corvallis is six miles distant (U.S. Army Corps of Engineers, 1891).

(Sinclair, 2005). The construction of levees and bank hardening to protect towns and farms further restricted the river to a single channel. Flooding was still a regular occurrence however, until the 1950s when the U.S. Corps of Engineers began construction of 13 major flood control reservoirs in the Willamette basin including several along the McKenzie River and Middle- and Coast-Forks of the Willamette River (seven above Green Island). While the dams have been very effective at limiting major flood events, they've also had a negative impact on aquatic habitat. In addition to blocking fish migration, they have also significantly limited large flood events, which historically created habitat features such as side channels and pools and also limited transport of woody debris and sediment, which are essential contributors to native fish habitat.

2.2 Green Island Site History

With Green Island's location near the confluence of two major rivers and relatively flat topography, river migration in this area has been a frequent occurrence and the channels of both the McKenzie and Willamette River have migrated across the site countless times over the centuries. Historic vegetation mapping based on the General Land Office surveys of the 1850s (Christy et al. 1999) indicate that prior to Euro-American settlement, Green Island was dominated by riparian forest and wetland with a small patch of prairie located near the north end of the site. Vegetation in this area was likely in a constant state of disturbance due to frequent high water events and channel migration.

ISource: Green Family

Jim and Jack Green (ca. 1930)

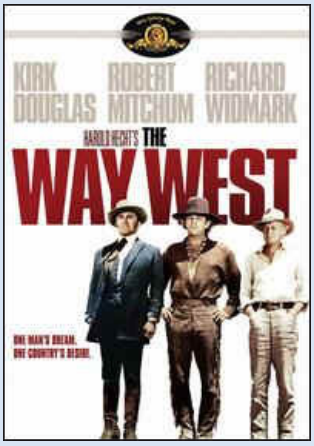
Beginning in the 1930s, the Green family began clearing the land to take advantage of the rich agricultural soils found on the island and eventually carving out 500 acres of tilled farmland. At the time, Green Island was bound by the McKenzie River to the east and the Willamette River to the west and the Greens used a ferry to cross McKenzie River to get to the farm. In 1964, a major flood event occurred in the valley. This resulted in a dramatic migration of the McKenzie River, which shifted its confluence with the Willamette River to the south of Green Island, several miles below the previous confluence. Farming though, continued on Green Island, much as it had prior to the river migration.

In the 1970s, the Green family placed a series of private dikes, bank revetments, and berms around the island, after the newly combined force of both the McKenzie and Willamette Rivers on that side of the island triggered increased erosion. In 1996, another flood event occurred in the area. Although only considered only a 20-30 year flood event, it resulted in considerable erosion, temporary loss of access, expensive levee repairs and clean-up costs, and new concerns about the future of the island.

The 1996 flood was also responsible for helping launch an initiative to develop a cooperative planning process to create a vision for the 11,000 acre confluence area, which includes Green Island at its core. This process, which was called the *McKenzie-Willamette Confluence Project*, brought together a team of private landowners, regulatory agencies, and citizen interest groups to develop a cooperative vision. This public-private partnership provided an in-depth analysis of opportunities for critical habitat protection and enhancement.

Members of the Green family and MRT worked together on this task force. One outcome was the initiation of a dialogue about ways MRT could help the family facilitate long-term protection and restoration of the Green's holdings on the island.

Deeply appreciative of the natural beauty and wildlife on the island, the Greens expressed a desire to see the landscape return as much as practical to its historic condition. Supported by funds from OWEB, the Eugene Water & Electric Board, the North American Wetlands Conservation Act, and the generosity of the Green family, MRT was able to acquire the property in 2003. Beginning in the 1930s, three generations of the Green family farmed the land, raising a wide array of crops including hops, mint, cherries, corn, grass seed, wheat, and a variety of row crops. It seems very appropriate that the island continue to bear the family's name.



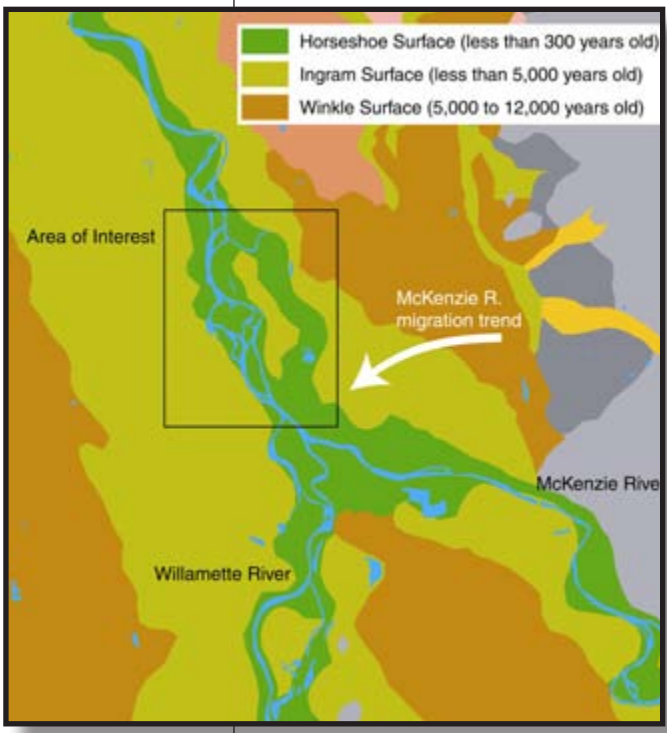
The Green Island property was used to film scenes in the 1967 western film, The Way West, starring Kirk Douglas, Robert Mitchum, and Sally Field.

Since the 2003 acquisition, MRT has made significant strides toward restoring habitat and floodplain function on Green Island and will continue to conduct additional study and plan for future enhancements to be implemented in coming years. Key to this future floodplain restoration was the purchase of an additional 56 acres of land by MRT on the east side of Green Island, now referred to as the Coburg Aggregate Reclamation Project (CARP). This acquisition includes several shallow gravel pits from the recently active aggregate mining operation, a segment of the historic McKenzie River channel, and riparian forest and wetland.

2.3 Geomorphic Surface

Geomorphic surfaces are coarsely mapped, but provide a useful understanding of the timeframes under which landscape types have developed. In floodplain areas such as Green Island, each fluvial geomorphic surface has formed as a result of erosion of the original sediment and replacement by locally derived alluvial material (gravels and fines) over a distinct period of time. The modern drainage network of the Willamette Valley began establishing approximately 13,000 years ago following the last *Missoula Flood Event* on the Columbia River. Since that time, three major geomorphic surfaces have established along the Willamette River and its tributaries. Green Island includes the two most recently formed geomporphic surfaces to have formed in the Willamette Valley including the *Horseshoe Surface*, which formed within the last 300 years, and the *Ingram Surface*, which most likely formed within the past 1,000 years on Green Island (Balster and Parsons, 1968). The Geomorphic Surfaces Map (right) is useful for showing the larger geomorphic setting within which Green Island is situated and clearly shows the southwesterly migration of the McKenzie River floodplain.

Geomorphic Surfaces Map



Source: Ecohydrology West (2002) interpretation of Balster and Parsons' geomporphic surfaces map (1968).

In 2002, *Ecohydrology West* conducted a more detailed assessment of Green Island's geomorphic elements and mapped their results. In summary, they determined that there is a main central platform, which is part of the older Ingram surface, a large bar and island assemblage, several larger coalescing islands, many secondary channels separating islands, cresentric lakes, and several miles of abandoned

Since the 1950s, a total of seven flood control dams have been constructed on the Willamette River and its tributaries above Green Island (Lookout Point Dam pictured above).

McKenzie River channel. Also noted are several miles of rip-rap on or adjacent to Green Island.

2.4 Floodplain and Flooding

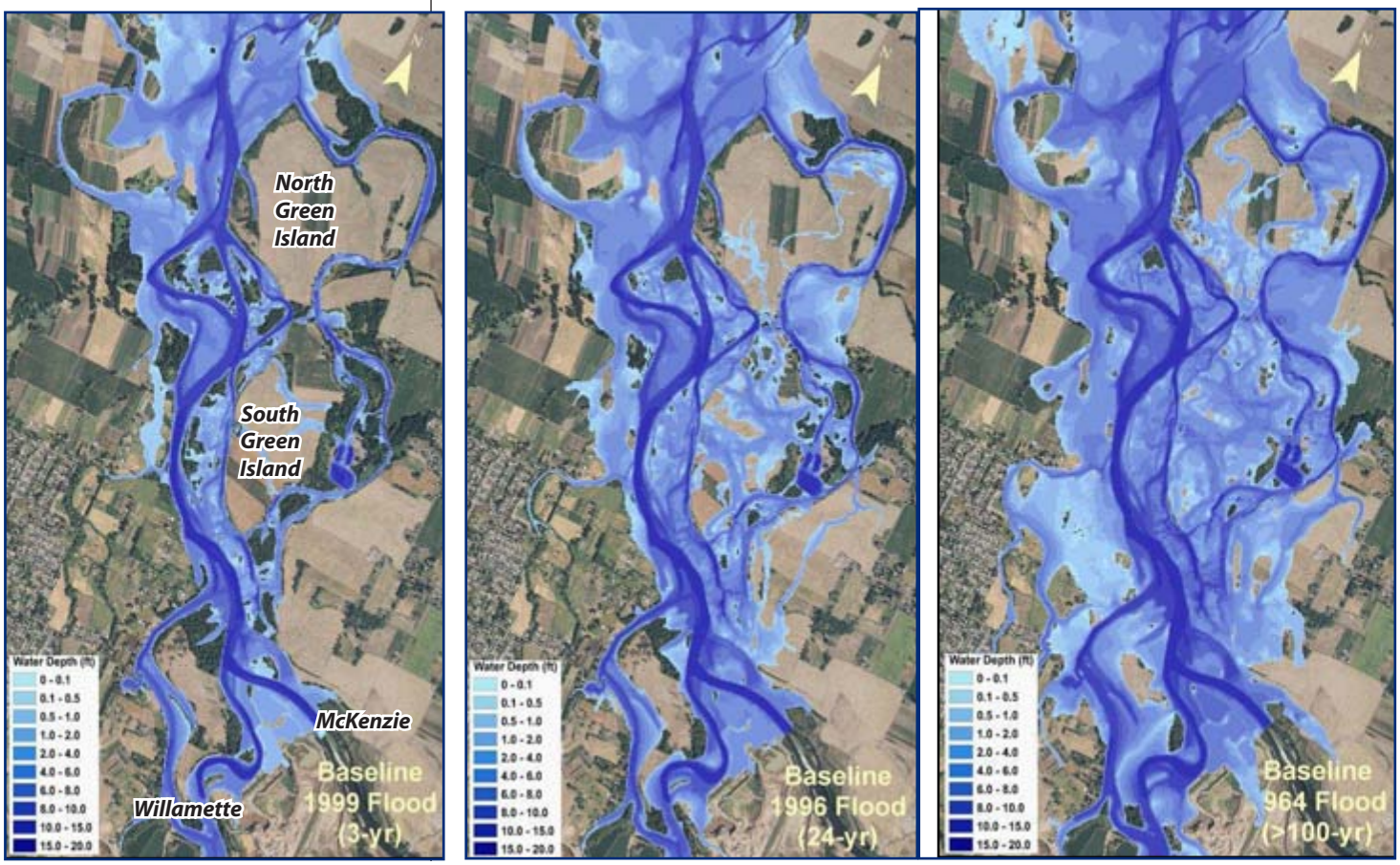
River flows at Green Island are greatly affected by upstream flood control dams. There are seven major flood control reservoirs above Green Island, the first becoming operational in 1943 and the last in 1969. Based on research and analysis conducted by *Ecohydrology West* (2002), the dams have reduced natural peak river flows at Green Island by approximately 45 percent and spring flows are lessened as these flows are stored and released over several months during the summer to increase low flows that naturally occurred during this period. Seasonally low (August) flows in the post-dam era are roughly twice the pre-dam flows at 5,000 cfs at the nearby Harrisburg gage.

Virtually all of Green Island and much of the surrounding landscape sit within the mapped 100-year floodplain of the Willamette River, although much of the site floods on a seasonal basis including the site's side channels, cresentric lakes, coalescing islands, and bars.

2.4.1 Floodplain Mapping

To better understand the patterns of channel and floodplain flow that occur at the site under a variety of high flow events as well as the potential changes

Simulated Maximum Inundation Depths



Source: DHI, 2009

estimating river levels on and around at Green Island. This gage has been collecting daily river flow data since 1945, and most importantly, since the last flood control dam on the Willamette River system was completed in 1969.

River flow, which is calculated in cubic feet per second (cfs) can be used to describe average seasonal condition and to predict inundation levels during flood events. The table below relates river flow and typical condition at Green Island during those flows. It is important to emphasize the difficulties of simulating the exact hydraulic behavior of such a dynamic site. However, this generalized information is valuable for helping inform management decisions for the site.

2.4.3 Hydraulic Modeling

The Green Island 2-dimensional hydraulic model developed by DHI will enable MRT and other stakeholders to better understand the patterns of channel and floodplain flow that occur at the site under a variety of high flow events as well as the potential changes in the hydraulics that may occur as a result of various restoration strategies. The model was constructed using DHI's MIKE 21 and simulates water-levels, velocities, and shear stresses for the Willamette River, the lowest reaches of the McKenzie River, and the various side-channels present on and near Green Island. In addition to calculating water levels, the model allows for the evaluation of velocity and shear stress distributions which in turn allows for study of the potential changes in stream morphology that may occur at the site during future flood events.

Table 2-1: Green Island Condition at Various River Levels

Threshold Level	Harrisburg Gage (post-1969 flows)	Condition at Green Island
Typical Annual Condition		
Summer flow (reference)	5,300 cfs	Flow is minimal in the Willamette side channel adjacent to the main site. Historic McKenzie channel holds water in a series of ponds (25+), many fed with subsurface water.
3 months/year	13,700 cfs	Crescent Lake is connected at the north end.
1 month/year	28,800 cfs	Historic McKenzie channel becomes active via subsurface flow. Channels at nexus (central site) become active via subsurface flow.
1 week/year	44,800 cfs	Secondary side channel to Willamette side channel is at bankfull. Crescent Lake is connected at both ends and historic McKenzie channel is active including side channel through CARP. Surface inundation of channels at the nexus.
Flood Events		
3-year event	55,400 cfs	Swales in northern half of site become active, southern swale at nexus is active, inundation on the main body of the site is minimal. Historic McKenzie channel and Crescent Lake are active with broader areas of inundation including CARP area.
8-year event	67,100 cfs	Swales on southern half of site are active and adjacent areas are inundated; inundation of floodplain in the north at former levee site.
24-year event	76,100 cfs	A significant portion of the southern half of the site becomes inundated; two historic swales on northern half of island become active; Historic McKenzie channel is active with broader areas of inundation.
100-year event	118,000 cfs	Almost the entire southern half of the island becomes inundated; a significant portion of the northern half of the island is inundated; Historic McKenzie channel active and all of CARP area is inundated.

Sources: Ecohydrology West (2002), DHI Water and Environment (2009), and MRT field observations (2008-2010)

2.4.4 Analysis of Side Channel Reconnection Potential

The *Green Island Hydraulic Modeling Technical Report* also analyzed possible reconnection of Crescent Lake, the historic McKenzie River channel, and the nexus (the narrow land area between north and south end of Green Island). These areas have been identified by MRT as having high potential for enhancing floodplain function. Since the analysis was conducted, MRT has implemented the proposed enhancements for Crescent Lake. In addition, MRT contracted with the River Design Group, Inc. in 2010 to conduct a high level feasibility study on potential restoration opportunities for the CARP site and the historic McKenzie River channel. A summary of the hydraulic analysis from both reports is as follows:

Crescent Lake:

The model was used to evaluate the feasibility of a scenario where a plug of sediment is removed at the north-western edge of Crescent Lake in order to allow an increased exchange of flow between Crescent Lake and the Willamette River to in order to benefit aquatic habitat. Additionally, the topography in the model was modified to reflect the re-contouring of the north bank of Crescent Lake so that the slope of the bank was much more gradual. This scenario was then evaluated with the model for each of the four flood events that were considered for baseline conditions.

Photo by Raptor Views

Fed by ground water (hyporheic flow), Crescent Lake provides a cold water refuge for native fishes.

In short, under the baseline condition, it was found that Crescent Lake was not connected to the Willamette River at a flow of 16,600 cfs, whereas under the scenario condition (plug removal), connection is achieved. The effects of the scenario modifications were determined to be localized and had essentially no impact elsewhere in the system. The model showed that during a 24-year flood event (approximately 76,100 cfs), Crescent Lake is connected to the Willamette River under baseline conditions.

The modifications to the site simulated under this scenario were successfully implemented by MRT in summer 2008. A relatively high flow occurred immediately after in November of 2008 and again in January 2011 and provided an opportunity to evaluate the as-built condition. Based on observations during these flows, connection occurs somewhere between 11,300 and 13,600 cfs. Based on preliminary assessment, it has been determined that the connection has potential to expand or migrate in the downstream direction in the future during large events.

Historic McKenzie River Re-Connection:

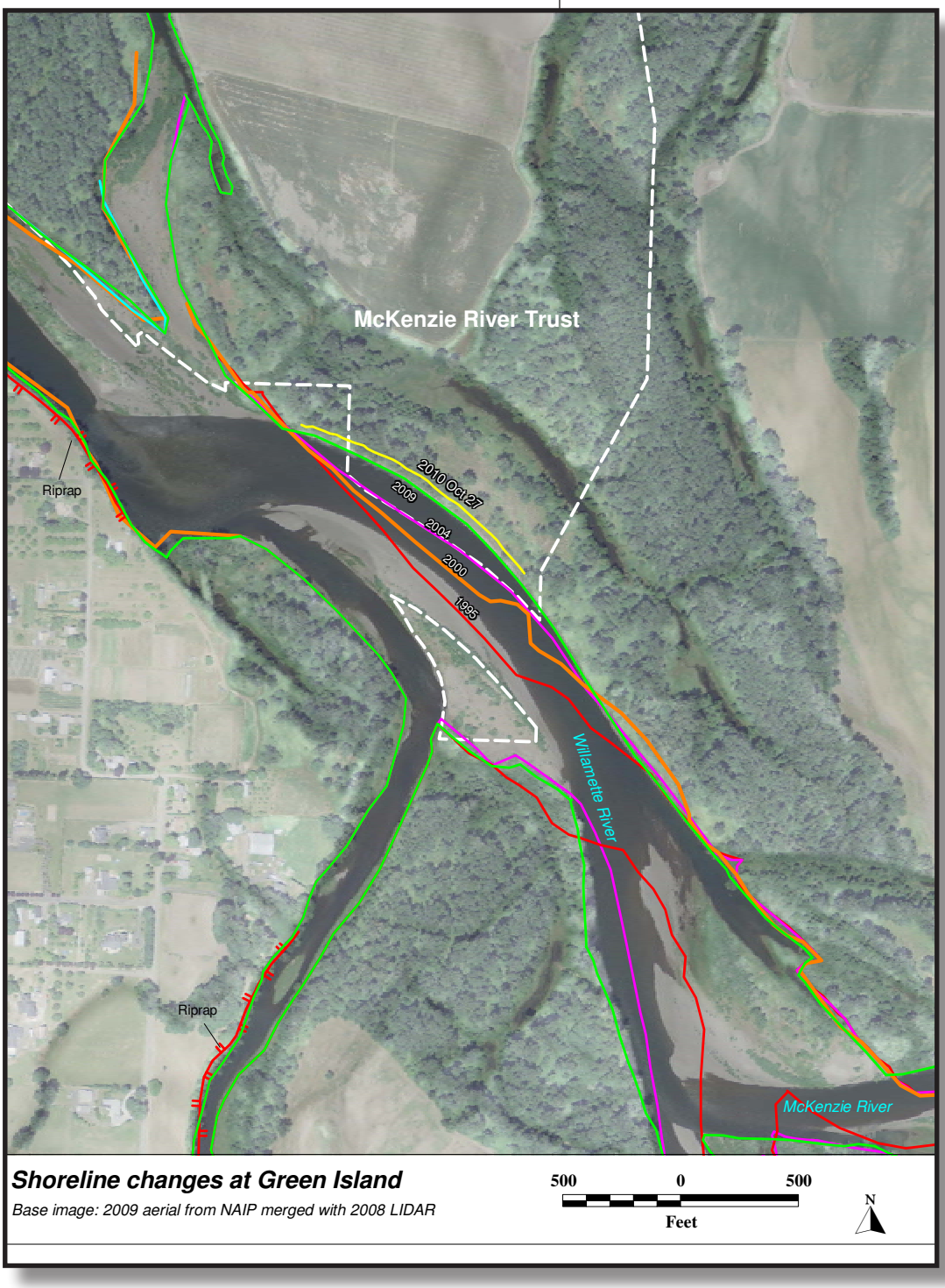
This restoration scenario developed by DHI builds on what was learned in the previous Crescent Lake re-connection scenario, plus several additional modifi-

cations. These included the removal of levees at the site along the head of the island, along the west-side of the historic McKenzie River channel in the southern and central portions of the island, and along the east-side of the Willamette River. Additionally, several breaches designed to increase the connectivity of the historic McKenzie River channel are included in the model. These breach locations include a small breach through a service road near the nexus (neck) of the island, and three breaches at the southern end of the island. Comparisons were then made between the baseline and scenario results both for the site as a whole and in the vicinity of the breaching locations to evaluate the effects of the levee removals and breaches on inundation and shear-stresses.

Comparing maximum inundation depths during the 3-year (1999) event for the scenario with those for baseline conditions reveals that the scenario modifications result in significantly more flow entering the historic McKenzie River channel relative to baseline conditions. Also, significantly more inundation occurs on the southern half of the island during the 3-year event relative to baseline conditions. Some additional inundation occurs on the northern half of the island as well in the area south of Crescent Lake. At 16,600 cfs, the model shows that the upper reaches of the historic McKenzie River channel and a side-channel to the Willamette River adjacent to the southern half of the island become active. Both channels were not shown to be active under baseline conditions. During the larger floods like the 24-year (1996) event, the effects of the scenario modifications become less pronounced.

Conclusions made from DHI's hydraulic modeling results suggest that shear stresses and velocities are relatively high at connection points between the Willamette River and the historical McKenzie River channel, indicating that

Mapping of shoreline change on the south end of Green Island between 1995 and 2010 illustrates how high shear stress in this area is resulting in Willamette River migration toward the historic McKenzie River channel (map produced by Jim Reed).



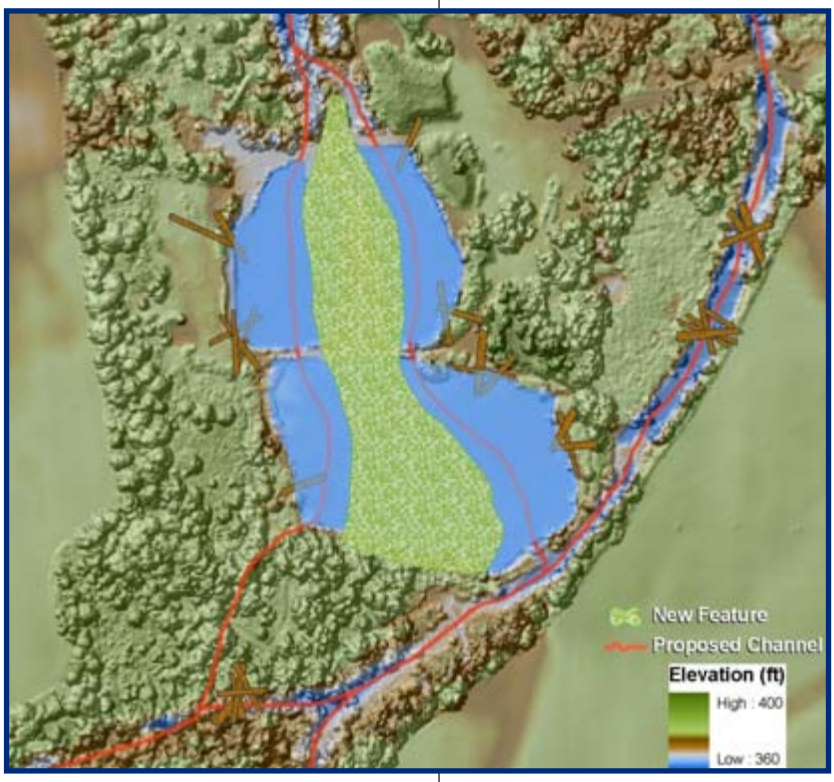
The CARP site is influenced greatly by groundwater flow (2010 aerial photo)

natural reconnection of the historical McKenzie River channel may eventually occur in several places without any constructed modifications. In addition, the model indicated that significant hydrologic interaction between the McKenzie River and Willamette River would be possible in the nexus area if the levee in that area were removed or culverted.

Coburg Aggregate Reclamation Project (CARP)

Similar hydraulic analysis is planned for the newly acquired 56 acre CARP area on the east side of Green Island to evaluate potential for enhancing and reconnecting the aggregate pits in this area to the floodplain on the historic McKenzie River. Analysis of this area will likely be completed in 2011/12 and will be used to guide floodplain restoration efforts in concert with other planned restoration prescriptions for the historic McKenzie channel.

In 2010, MRT contracted with the River Design Group, Inc. (RDG) to conduct a high level feasibility study on potential restoration opportunities for the CARP site. Based on site observations, existing studies, and knowledge of rivers, RDG concluded that in order to significantly increase salmonid production in the gravel pit pond area, it is necessary to connect the historical McKenzie River channel with the mainstem Willamette River on a more frequent basis. Based on this assessment, RDG proposed and analyzed several restoration alternatives that included improving the connectivity of the ponds with the existing historical channel, creating linear features from the ponds to promote better surface flow and shading, adding large wood to the existing historical McKenzie River channel to improve surface flow into the ponds, adding large wood habitat in the existing ponds, and completing extensive planting of native species at the site to promote stream shading over time. Their report was completed in March 2010 and summarizes analysis and conceptual designs.



Preliminary restoration concept for the CARP site, produced by the River Design Group

In the report, RDG recommended a preferred design concept that could be carried forward for further analysis and refinement. The concept proposes re-contouring the ponds to create linear features that are similar to historical channels found on properly functioning floodplains in the Willamette River system. Implementation of this concept would require excavating parts of the historical McKenzie River channel, removing a road, and demolishing a floodplain berm to provide fill material to create an island through the ponds. This would convert the ponds to linear channel features with higher water velocities, greater fringe habitat, improved water quality, and aquatic habitat conditions beneficial to native fish species and less hospitable for warm water non-native fish. Narrower channels would enable planting vegetation closer to a greater portion of the water surface, over time resulting in more shading, detritus input,

and eventual habitat creation relative to the existing condition. Species expected to benefit from the creation of linear features include; spring Chinook, steelhead, and cutthroat trout. The concept also includes placement of large engineered log jams at existing high points in the bed of the historical McKenzie River channel downstream of the inlet points to the newly created linear channel features.

2.5 Topography and Hydrology

Like most rivers, the Willamette is fed not by a single source, but by numerous tributaries from within its 12,000 square mile watershed that lies between the crests of the Coast Range and Cascade Range. The four major tributaries found in proximity to Green Island are the Coast Fork and Middle Fork of the Willamette River, which converge approximately eleven river miles above Green Island; the McKenzie River, which converges with the Willamette River Main Stem just to the south side of Green Island; and the Long Tom River, which flows into the Willamette approximately 27 miles downstream of Green Island. Because of its location at the confluence of two major rivers, Green Island exhibits a complex surface and sub-surface interactions, which is summarized in section 2.4.3. In the coming years, additional study and observations will help further understand this relationship.

2.4.1 Topography

Green Island is a landscape sculpted by floods and river migration. The site has an overall flat character, but has significant microtopography, primarily in the form of flood channels and terraces. Numerous shallow swales run through both the northern and southern half of the site. The only significant disturbances to this river sculpted topography are the shallow gravel pits located on the newly acquired CARP area on the eastern edge of the site, which are currently bordered by roughly graded mounds of aggregate and a smaller pit located on the south side of Green Island. On the southern half of the site, elevations range from approximately 365 feet (above sea level) at the low water level of the river up to between 370 to 375 feet on the upper terrace. The low water river level on the north end of the site is approximately 350 feet and the upper terrace in that area ranges between 360 and 365 feet.

Seasonally flooded swales on south side of Green Island (2010)

Photo by Chris Vogel

Green Island during the 2006 flood event (Willamette River level at 73,000 cfs at Harrisburg gage)

2.4.2 Surface Hydrology

The surface hydrology on Green Island is influenced by two primary factors. First is the seasonal flooding that occurs to varying degrees across the site from the nearby McKenzie and Willamette Rivers. The extent and duration of this inundation is based on river levels and surface elevation of the land. Flood inundation on the site tends to be of short duration and dissipates as river levels drop. River levels today are highly dependent on upstream dam releases, which tend to reduce peak flows, but at the same time, extend the duration of high flows. Baseline flood elevations and depths have been calculated for the site for various flood events (see Section 2.4.1). The second factor influencing the surface hydrology present on Green Island is the presence of groundwater that recharges low spots on the site including many of the remnant side channels and the aggregate pits. This inflow of groundwater keeps many of these areas wet throughout the year. This subsurface flow can be especially evident during the wet season along the historic McKenzie River channel.

2.4.3 Sub-Surface Hydrology

Because of its proximity to two major river systems, significant and complex sub-surface flow is undoubtedly occurring in the hyporheic zone beneath Green Island. The hyporheic zone is a region beneath and adjacent to a river or stream, where there is mixing of shallow groundwater and surface water. The flow dynamics and behavior in this zone, known as hyporheic flow, is recognized to be important for surface water/groundwater interactions, as well as fish spawning and other processes. Recent research on hyporheic flows in the mainstem Willamette River shows that alcoves associated with active gravel bars or floodplain areas with evidence of historical channels are colder than other alcoves (Gregory and Hulse, 2008).

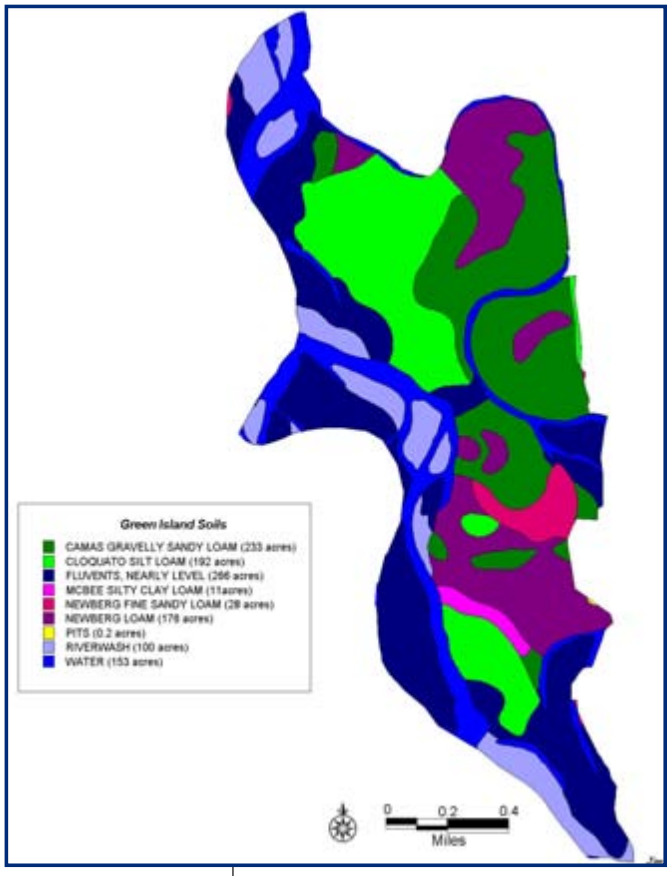
As part of EPA's Willamette Ecosystem Services Project, the EPA is currently studying the interaction of ground water and surface water and how it benefits water quality. Additionally, the EPA is in the process of modeling the sub-surface flow and a suite of water quality parameters. Preliminary results indicate that groundwater responds rapidly to changes in river

Green Island Topography

stage at Green Island and probably much of the Willamette River. The direction of water in the subsurface changes from deep parallel with the river flow paths during low discharge to shallow perpendicular flows during high discharge based on modeling and intensive monitoring.
It has also been well document by ODFW (Sheerer and Bangs), OSU (Gregory and Wildman, Department of Fisheries & Wildlife), and MRT field staff that hyporheic flows feed the historic McKenzie River channel through much of the winter and summer, resulting in significant flows and temperature variations in the historic McKenzie River channel and other secondary channels, well before surface connections from the Willamette River become active. This is a significant finding and will continue to be monitored and documented in the coming years.

2.5 Soils

The soil types that have formed at Green Island have been significantly influenced by frequent flooding and deposition that occurs in this location. Areas with more frequent flooding tend to have more poorly developed soils and are typically complex due to frequent sedimentation and erosion. The higher areas on Green Island flood less frequently, and with slower, backwater conditions, have better-developed soils, often with higher silt and loam content. The lower areas that are subject to more frequent flooding have a higher component of sand, gravel, and cobbles, and relatively less organic material. Lack of organic material often makes it difficult to establish vegetation in these areas. All of the soil types present on Green Island tend to be well drained due to the high loam, sand, and gravel content.



Soils Map (Salix Associates and Jim Reed, 2004)

The Green Island Soils map (right) shows the general distribution of the soil units across the site based on the Lane County Soil Survey produced by NRCS. It should be noted that even in the short period of time since the soils were mapped (mid 1980s) the river has migrated and the locations of water and riverwash have shifted. The recent CARP acquisition does not appear on this map, but is primary a continuation of the adjacent Camas Gravelly Sandy Loam soil type, interspersed with pits.

2.6 Vegetation

The vegetation communities, along with the dominance and variety plant species present on Green Island, has changed dramatically over the past century due to the combined result of agricultural conversion, river migration, and introduction of invasive species. Transition of agricultural lands back to riparian forest and prairie along with invasive species control have already begun at Green Island and this transition will continue in the coming decades as restoration efforts expand, as major flood events re-shape the land, as the remaining agricultural crops are phased out, and as new invasive species colonize the site.

The vegetation of Green Island exists in a dynamic riparian environment that has been shaped by the Willamette and McKenzie rivers. Although flooding has been reduced due to the installation of upstream dams, this influence will continue to shape the vegetation into the future as has been demonstrated by several significant flood events that have occurred over the past several decades.

Surveyor's Description of Sources of Willamette River Vegetation, 1852:

The bottoms along the Willamette are heavily timbered with [grand] fir, [big leaf] maple, [Oregon] ash, Balm of Gilead [black cottonwood], and a dense undergrowth of vine maple, hazel, and briers ... there are numerous sloughs that would make the township impossible to survey in the winter [General Land Office Survey T13S R4W, 1852].

Photo by Raptor Views

Green Island contains a mix of vegetation types as shown in this photo of the southern half of Green Island (looking south)

Flood disturbance affects vegetation in many ways. Rapidly flowing water can scour away vast quantities of soil and knock down and remove vegetation including trees and shrubs as was observed in the January 2011 flood event where approximately seven acres of one of the MRT owned islands eroded away in a matter of days. Active channels can be relocated great distances from their previous locations as was demonstrated in the 1964 flood. Conversely, flooding also deposits silt, sand, gravel, and cobbles to form new surfaces on top of previously existing ones, which was also observed after the 2011 flood.

Periodic flooding "resets the successional clock" relatively frequently, in different ways in different locations, forming a mosaic of vegetation patterns that continue to change through time. Disturbance from flooding results in conditions that favor early successional species and related plant associations. Open habitats are colonized by willows, cottonwoods, and a variety of herbaceous species (both native and exotic). When the time between disturbances is relatively long, succession of plant communities tends to proceed from herb and shrub associations to deciduous forest, and eventually to coniferous forest dominated by more shade-tolerant species. Shorelines and other low-lying areas generally remain in the early phases of this successional sequence, because the frequent flooding results in the "resetting" back to disturbance-adapted species. Higher terraces generally advance farther in the successional process before being reset because of the larger flooding event needed to disturb those areas (Salix Associates, 2005).

The first comprehensive vegetation study of Green Island was conducted by Salix Associates shortly after the MRT acquisition of the property. This detailed survey included on-site inventory and mapping of vegetation communities in the summer of 2004 and included recording of significant native and invasive species populations encountered. The results of the survey are intended to inform the development of the Management Plan and key findings are summarized below. It should be noted that significant restoration efforts have begun since this initial survey and the CARP acquisition expanded the extent of the site by 56 acres.

Current vegetation present on Green Island can be categorized into three broad categories:

- Cultivated areas: where few natives currently exist
- Areas in early phases of restoration: where native trees or grasses have been re-introduced and are in the early stages of establishment
- Non-cultivated areas: Generally include riparian forests and sloughs with some native understory, but typically dominated by reed-canarygrass and Armenian blackberry along with open water (riverine, side channels, and gravel pits), and bars.

2.6.1 Historic Vegetation Patterns

Before EuroAmerican settlement of western Oregon began in the mid 1800s, the Willamette and McKenzie river systems generally were comprised of more complex channel configurations which changed frequently as a result of annual flooding. Frequent fires that were intentionally set by aboriginal people in the Willamette Valley created landscapes that were comparatively open, primarily comprised of prairie and savanna vegetation. Areas along river floodplains tended to be moister and less prone to burning, so were typically forested, but more prone to disturbances caused by flooding.

Historic vegetation mapping based on the General Land Office surveys of the 1850s (compiled by Christy et al. 1999) indicate that prior to Euro-American settlement, Green Island was dominated by *riparian forest and wetlands* with a small patch of *prairie* located near the north end of the site. The mapping also indicated a number of river channels on the site.

2.6.2 Current Vegetation Communities

The Green Island vegetation communities described below are a snapshot in time and will likely be changing significantly in extent and quality as vegetation enhancement and management efforts are completed, as natural succession occurs, and as future flood events reshape the land.

Riparian Forest (mature with closed canopy)

Riparian forest is primarily located on islands and edges of the Willamette River and along portions of the historic McKenzie River channel. These areas include a dense mix of established trees with a closed canopy. The riparian forest areas are typically dominated by black cottonwood (*Populus trichocarpa*), but also include bigleaf maple (*Acer macrophyllum*), red alder (*Alnus rubra*), Pacific willow (*Salix lucida* ssp. *lasiandra*), and Oregon ash (*Fraxinus latifolia*). Forest understories are frequently dominated by non-native Armenian blackberry (*Rubus armeniacus*) and/or reed canarygrass (*Phalaris arundinacea*), although there are a few areas, such as Gallery Island, in which the understory is relatively non-weedy and the herb and shrub layers have a diversity of native species.

Photo by Raptor Views

Established riparian forest on the south end of Green Island

Riparian (open tree canopy, shrubs, grass)

This category includes areas along river edges and side channels where a closed canopy of trees has not fully formed, but where riparian vegetation is present in the form of shrubs, grasses, or scattered trees. In general, these areas tend to have more frequent flooding or other disturbances, more seasonal standing water, or shallow soils. Vegetation in these areas includes some scattered trees such as Pacific willow, creek dogwood (*Cornus sericea*), bigleaf maple, and black cottonwood and some native shrubs and grasses, but are often dominated by non-native Armenian blackberry and/or reed canarygrass. On Green Island, there

is a spectrum of tree cover in the riparian areas ranging from entirely enclosed canopy to open grass.

Photo by Jeff Krueger

Young trees planted on the north side of Green Island in 2008

Riparian Forest in Early Phases of Restoration

Between 2005 and 2010, MRT has begun converting the agricultural cropland and areas where levees have been removed to riparian forest on the northern half of the island, now totaling nearly 230 acres (see Section 2.11.1). The process has typically involved site preparation to reduce the presence of the agricultural crop (grass or wheat), followed by seeding of aggressive native grasses to help limit weed invasion, and finally tree planting. Tree species planted in these areas, in order of quantities, include black cottonwood, bigleaf maple, Oregon ash, red alder, Western redcedar (*Thuja plicata*), White alder (*Alnus rhombifolia*), ponderosa pine (*Pinus ponderosa*), grand fir (*Abies grandis*) and Oregon white oak (*Quercus garryana*). Over time, native shrubs will be incorporated into these areas to increase diversity. In 2011, riparian restoration efforts were begun on the far southern edge of the island.

Swales in Early Phases of Restoration

A number of shallow swales cross Green Island. On the northern half of Green Island, these sloughs have recently been phased out of agricultural use and some have been planted with riparian trees. A network of similar swales is also present on the southern half of Green Island, but is currently being farmed.

Prairie in Early Phases of Restoration

In 2008 and 2009, restoration efforts led by the USFWS were begun on approximately 62 acres of upland prairie in the northern portion of the site, referred to as *Confluence Prairie*. The restoration effort here included spraying and tilling to reduce the agricultural crop (perennial and annual rye grasses), followed by planting of five native grass species using a seed drill. Grass species planted include blue wildrye (*Elymus glaucus*), tufted hairgrass (*Deschampsia cespitosa*), California oatgrass (*Danthonia californica*), Roemer's fescue (*Festuca roemeri*), and California brome (*Bromus carinatus*). This effort is a work in progress and the effort will continue to work toward establishing native cover to limit weed invasion and to increase diversity of the prairie over time.

Wheat crop on southern half of Green Island (2010)

Photo by Chris Vogel

Agricultural Crops

When MRT acquired Green Island in 2003, the majority of the upper terraces were occupied by cultivated croplands and had been for nearly 80 years. Cultivated crops included ryegrass, tall fescue, wheat, and other row crops, with a small area devoted to a cherry orchard and a hybrid poplar plantation. Beginning in 2005, portions of the north began being phased out of agricultural production. By 2009, all of the agricultural land on the northern half of the island had been phased out for riparian restoration, and the trees in the poplar plantation and the cherry orchard on the southern half of the

island has been removed. Agricultural production on the southern half of the island, totaling approximately 167 acres (2011), will continue on an interim basis through a farm lease, and will be phased out over the next several years and converted to riparian forest.

Coniferous forest pictured in January 2011 after initial thinning

Coniferous Forest

A small patch of closed canopied coniferous forest, approximately three acres in size, is located just to the south of the MRT outbuildings and adjacent to the agricultural land to the west and riparian forest to the east. This area was planted in the early 1980s, likely for timber production. The stand consists entirely of Douglas-fir, which were planted at a very high density.

Sand and Gravel Bars

Sand and gravel bars of shoreline areas and overflow flood channels are the most dynamic and frequently disturbed areas on the site. These areas tend to be sparsely vegetated with species adapted for rapid colonization of open sites, especially annual grasses and forbs, willows, and cottonwoods. Weedy exotic species make up a large proportion of the herbaceous vegetation in these areas as well.

River Side Channels

Numerous river side channels or shallow backwater areas are located on the site including portions of the historic McKenzie River channel, Crescent Lake, and several channels parallel to the Willamette River on the southern and western edge of Green Island. These side channels provide habitat for aquatic vegetation and typically retain standing or moving water throughout the year. In these areas, plant communities are comprised of floating, submersed, and emergent plant species including pondweeds (*Potamogeton* spp.), water starworts (*Callitriche* spp.), sedges (*Carex* spp.), flatsedges (*Cyperus* spp.), rushes (*Juncus* spp.) and others. Most are native species, but a few are invasive exotics.

Photo by Raptor Views

A broad meander creates numerous habitats with large wood debris, side channels, and gravel bars (Willamette River adjacent to Crescent Lake pictured).

Open Water

The site also includes areas of open water in the form of riverine habitat associated with the active channel of the Willamette River and in the four gravel pit ponds found on the site. The gravel pit ponds cover approximately 12 acres and are generally less than twenty feet in depth. Aquatic vegetation inventories have not been conducted in these open water areas.

Definitions:

Native Species: Plant or animal species that are know to have occurred in the Willamette Valley prior to Euro-American settlement.

Rare Species: A native plant or animal species that is rare to very uncommon on the Willamette Valley floor.

Exotic Species: Plant or animal species that is not native to the Willamette Valley floor.

Invasive species: A non-native plant or animal species that is considered to have, or potentially have, high or medium impact on wildland areas.

Disturbed Area

A recently disturbed area, approximately 15 acres in size, is located around the perimeter of the gavel pit ponds on the newly acquired CARP property and is associated with the mining operation. This area includes large aggregate and soil piles and areas of compacted gravel. Weedy vegetation including blackberry, Scot's Broom (*Cytisus scoparius*), shining geranium (*Geranium lucidum*) reed canarygrass, thistle (*Cirsium arvense)*, and jimsonweed (*Datura stranonium*) have colonized some of this area. Native grass seed was planted in fall 2010 to hold the soil until a restoration strategy is developed for this area.

2.6.3 Plant Species Summary

The best available data on Green Island vegetation was compiled in 2004/2005 by Salix Associates. During this inventory, field crews spent a total of 12 person-days inventorying and mapping Green Island's vegetation, which they then supplemented by additional aerial photo interpretation. Locations of vegetation types and individual plant species were documented including rare and uncommon plant populations (Section 2.6.4) and invasive species (Section 2.6.5). The results of this survey are summarized below and documented in the *Inventory and Assessment of Vegetation and Restoration and Management Recommendations for Green Island* (Salix Associates, 2005), including a comprehensive list of vascular plants observed. This survey did not include the 56-acre CARP acquisition, but the vegetation conditions there are similar to what is found elsewhere on Green Island, although much of the area is in a highly disturbed condition due to the recent aggregate mining operation, and devoid of vegetation.

During the Salix Associates survey, a total of 289 plant species were observed, and they are about evenly divided between native and exotic. Two exotic species are first records for Lane County (*Anchusa arvensis* and *Eragrostis pectinata* var. *pectinata*). Eleven species were recorded that are rare to very uncommon on the Willamette Valley floor. Invasive and rare species are listed below. The following table illustrates the native versus exotic composition of Green Island vegetation by structural layer.

2.6.4 Rare and Uncommon Plant Populations

During the 2004 Salix Associates inventory, no plant species were found that are federal or state listed, or tracked by the Oregon Natural Heritage Information Center (ORNHIC) as rare species in the state, and the ORNHIC database contains no records of rare plant species within 2 miles of the site. However, fourteen

Table 2-2: Summary of Green Island Native and Exotic Vegetation

Layer	Native Species (Rare Species)	Exotic Species (Invasive Species)	Total
Trees	12 (0)	5 (1)	17
Shrubs/Small Trees	23 (0)	8 (6)	31
Forbs	76 (7)	103 (39)	179
Graminoid	32 (4)	25 (14)	57
Ferns and Allies	5 (0)	0 (0)	5
TOTAL	148 (11)	141 (60)	289
% of TOTAL (289)	51% (4%)	49% (21%)	100%

Source: Salix Associates (2004)

Table 2-3: Rare and Uncommon Native Vascular Plants at Green Island

Common name	Latin Name	Comments
Hall's bentgrass	*Agrostis hallii*	Uncommon in upland prairies and woodland edges in Willamette Valley. May be easily overlooked.
Hood's sedge	*Carex hoodii*	A species of mesic meadows in the Cascade and Coast ranges.
Ross' sedge	*Carex rossii*	Uncommon on Willamette Valley floor.
wedge-leaf ceanothus	*Ceanothus cuneatus*	Uncommon in Willamette Valley, more common in southwest Oregon and California
creeping eragrostis	*Eragrostis hypnoides*	Very rare on Willamette Valley floor.
turkey mullein	*Eremocarpus setigerus*	Uncommon in Willamette Valley, more common in southwest Oregon and California
barestem buckwheat	*Eriogonum nudum*	Cascade Range species of open habitats. Very rare on the Willamette Valley floor.
chocolate lily	*Fritillaria affinis*	Rare on Valley floor. More common just up on foothill slopes.
bluefield gilia	*Gilia capitata var. capitata*	Rare on Valley floor. More common just up on foothill slopes.
Oregon golden aster	*Heterotheca oregana*	Rare in the Willamette Valley. A few sites in far southwestern Oregon.
prairie star	*Lithophragma parviflora*	Rare on Valley floor. More common just up on foothill slopes.
woodland phacelia	*Phacelia nemoralis*	Uncommon in Willamette Valley, scattered in Cascade and Coast ranges
broadleaved pondweed	*Potamogeton amplifolius*	Rare in Lane Co., and rare in OR. Only a few sites known, all in western Oregon.
weak mannagrass	*Torreyochloa pallida var. pauciflora*	Very rare on the Willamette Valley floor. More common in mountains.

Source: Inventory and Assessment of Vegetation and Restoration and Management Recommendations for Green Island (Salix Associates, 2005)

native plant species were documented at Green Island that are rare or uncommon on the Willamette Valley floor – most of these plants are more common elsewhere. Some are plants of montane habitats, whose seed likely floated down the McKenzie or Willamette Rivers to be deposited at Green Island. Others are uncommon in the Willamette Valley, either because of habitat loss or because they are near the limits of their natural range. Table 2-3 summarizes uncommon plants found on the site.

2.6.5 Invasive Exotic Vegetation

Frequent disturbance and ongoing input of weed seeds by flooding, birds and other wildlife, and agricultural activities have combined to cause most non-agricultural habitats on Green Island to be dominated by invasive, exotic (non-native) plants. Although trees on Green Island are nearly all native, shrub and herb components of most habitats are predominantly exotic and invasive.

Armenian blackberry and reed canarygrass are among the most widespread exotic species currently present on the Green Island and occur in dense thickets across much of the forested portions of the site. The few forested habitats,

Japanese knotweed monitoring

Photo by MRT staff

which do contain mostly native understories, will likely be invaded over time without management intervention. Some aquatic habitats are being converted from native to exotic invasive-dominated associations as well. Aquatic invasive species on the site include parrot's feather (*Myriophyllum aquaticum*) and crisp-leaved pondweed (*Potamogeton crispus*).

Some recently arrived, aggressively invasive species have the potential to further impact habitats. Bohemian, Japanese, and giant knotweeds (*Polygonum Xbohemicum*, *P. cuspidatum*, *P. sachalinense*), false brome (*Brachypodium sylvaticum*), traveler's joy (*Clematis vitalba*), and shining geranium (*Geranium lucidum*) fall in this category. The three knotweed species are capable of invading riparian areas where they form dense monocultures that exclude virtually all other vegetation. False brome has spread through forested areas in northwest Oregon, reducing or eliminating native understory vegetation. This species also invades a broad range of habitats from dry to wet, and from forest to grassland. Traveler's joy is capable of climbing high into trees, and smothering other, shorter vegetation in riparian areas (Identification of this species should be done with caution, as it resembles the native western clematis, which also is present on the Island). Shining geranium is a weed of forest understories, and like false brome, is capable of dominating the understory to the detriment of native understory species. Patches of all six of these species were found scattered in the project area. The largest concentration is in the west-central part of the project area, where four of the six species are found.

Table 2-4: High and Medium Impact Invasive Plant Species

Scientific name	Common name
HIGH IMPACT: new arrivals	
Brachypodium sylvaticum	false brome
Buddleja davidii	butterfly bush
Clematis vitalba	traveler's joy
Geranium lucidum	shining geranium
Polygonum cuspidatum *Polygonum sachalinense* *Polygonum Xbohemicum*	Japanese knotweed giant knotweed Bohemian knotweed
MEDIUM IMPACT: or HIGH impact and established	
Agrostis capillaris *Agrostis stolonifera*	colonial bentgrass creeping bentgrass
Centaurea stoebe ssp. *micranthus*	spotted knapweed
Crataegus monogyna	English hawthorn
Cynosurus echinatus	hedgehog dogtail
Cytisus scoparius	Scot's broom
Foeniculum vulgare	fennel
Hedera helix	English ivy
Ilex aquifolium	English holly
Impatiens capensis	spotted jewelweed
Leucanthemum vulgare	oxeye daisy
Ligustrum vulgare	privet
Mentha pulegium	pennyroyal
Myriophyllum aquaticum	parrot's feather
Rosa eglanteria	sweetbriar rose
Phalaris arundinacea	reed canarygrass
Prunus avium	sweet cherry
Rubus armeniacus	Armenian blackberry
Solanum dulcamara	bitter nightshade
OTHER: Other weed species noted on Green Island, targeted for control	
Datura stramonium	jimsonweed
Senecio jacobaea	Tansy ragwort
Iris pseudacorus	Yellow flag iris
Lythrum salicaria	Purple loosestrife

Source: *Inventory and Assessment of Vegetation and Restoration and Management Recommendations for Green Island* (Salix Associates, 2005) and field observations by MRT and LCOG staff.

Photo by Jeff Krueger

Reed canarygrass is a common invasive species along waterways throughout the Willamette valley (historic McKenzie River channel at Green Island pictured above).

Green Island Management Plan

Existing Conditions and Recent Enhancement Activities Map

June 2011

0 500 1,000 feet

Scale

One Acre

Aerial Photo: Summer 2009

Map produced by LCOG

Legend

- Green Island Site Boundary
- Riverine (Summer Flow 2009)*
- Sand and Gravel Bars (Summer 2009)*
- Riparian Forest (mature with closed canopy)
- Riparian (open tree canopy/shrubs/grass)
- Pits (aggregate extraction area with water)
- Disturbed Area (bare soil or gravel)
- River Side Channels (significant seasonal flow)
- Levee Removal Area (2007/2010)
- Large Woody Debris Placed (2008/2010)
- Riparian Restoration Area (Tree Planting)
- Swales (seasonal inundation)
- Agriculture (with swales shown in blue)
- Prairie Restoration Area
- Invasive Vegetation Control

*The main river channel and associated bars are part of a dynamic system that migrates on a regular basis.

McKenzie
Historic
Channel
Riparian Tree Planting
Powerline Pond
Plug Removed
Prairie Enhancement (2008-2009)
Crescent Lake Reconnection and Bank Restoration (2008)
Crescent Lake
Willamette
Riparian Tree and Shrub Planting
Riparian Tree Planting
Staging
Levee
Removal
Green Island Road
(MRT ownership to Coburg Bottom Loop Rd.)
MRT Easement
Out-buildings and Staging
swale
Hybrid Poplars Removed
Fir Forest (2010 thin)
Agriculture (corn)
Aggregate Pits
Borrow Pit
Cherry Orchard Removed (2009) Planted (2011)
Agriculture (native grass planted 2011)
River
Eugene UGB
McKenzie River

Green Island Management Plan

Infrastructure and Facilities Map

DRAFT
May
2011

0 500 1,000 feet
Scale

N
W E
S

One Acre

Aerial Photo:
Summer 2009

Map produced by LCOG

Pylons
BPA Transmission Lines and Right of Way
Crescent Lake
Willamette
Levee/Berm Removed (2007)
Temporary Staging Area
Levee Removed (2009)
Low Water Crossing
Green Island Road (MRT ownership/easement)
MRT Easement
Historic Ferry Crossing
MRT Outbuildings and Staging Area
CARP
County Gate
River
McKenzie River

Legend

- Green Island Site Boundary
- All Season Roads (gravel surface)
- Travel Lanes - Dry Season (gravel/dirt)
- Electric Lines (EPUD and BPA)
- EPUD Poles
- Wells (irrigation)
- EPA Research Wells
- Major Culverts
- Existing Levee or Flood Control Berm
- Levee Removed (2007/2009)
- Existing Revetment
- Gates
- Designated Parking Area

Source: Features shown on this map are based on a combination of 2010 field observations, aerial photo interpretation, and maps shape files provided by MRT from various sources.

Table 2-4 lists the invasive species known to be present at Green Island and their degree of invasiveness based on classifications devised by the Native Plant Society of Oregon, Emerald Chapter.

2.7 Wildlife

Green Island is known to provide some of the best remaining wildlife habitat in the upper Willamette River system for a range of native fish, reptile, amphibian, bird, and mammal species and will likely continue to improve in the coming years as proposed enhancements are implemented.

2.7.1 Fish

The McKenzie and Willamette rivers support anadromous and resident fish species including the following strategy species identified by ODFW in Oregon Conservation Strategy Willamette Valley Ecoregion: spring Chinook salmon, bull trout, Oregon chub, Pacific lamprey, Western brook lamprey and cutthroat trout, all of which have been found in the waters around Green Island. The relatively complex network of channels, alcoves, backwater sloughs, and gravel bars present on and around Green Island provide important habitat for these native species. Information regarding the fish species inhabiting the confluence area is a summary of the *2000 Biological Evaluation* prepared by *WaterWork Consulting* (Andrus 2000); *Confluence Island: an assessment of current and future opportunities for ecological restoration at the confluence of the McKenzie and Willamette Rivers* (Gregory and Hulse, 2008); and *River Design Group*, Inc. (March 2010).

Photo by Stan Gregory

Juvenile spring Chinook salmon find refuge throughout Green Island.

During an electrofishing survey conducted in September 1999 in the confluence area, natural alcoves were found to have the greatest diversity of small fish. Alcoves and natural ponds were found to provide a specialized habitat that supported high densities of native fish. While introduced fish were sometimes found in alcoves, they were usually found in only small numbers. Surveys conducted in September 1999 and March 2000 found the highest concentrations of non-native fish species to be in the gravel pit ponds on and around Green Island. Likely factors that make gravel pit ponds unfavorable to native fish include elevated water temperatures, low dissolved oxygen, lack of suitable food, predation by largemouth bass, and competition for food by small introduced fish (Andrus 2000).

Photo by Jeff Krueger

Oregon chub have been located in portions of the historic McKenzie River channel.

A sample in 2008 (Gregory and Hulse, 2008), found that fish community of Confluence Island is comprised of 23 native fish species and 11 non-native species. The most abundant species were Northern pikeminnow, largescale sucker, cutthroat trout, juvenile spring Chinook salmon, redside

shiners, reticulate sculpin, and speckled dace. Fifteen native fish species were collected or observed in the mainstem of the Willamette River, 20 native species in the side channel, and 8 native species in alcoves. No non-native species were observed in the mainstem channel, two non-native species were observed in the side channel and two in alcoves. In surveys of the Willamette River side channel adjacent to nexus and the north floodplain, Gregory and Wildman have found a total of 15 native fish species in a 100 meter reach. This is a significant percentage of the 23 native species found in this area. The Oregon chub found in the historic McKenzie River channel is the closest known population to the mainstem Willamette River of all known chub populations.

Non-native fish species are also abundant on and around Green Island. During surveys conducted in January and April of 2008, twelve native and nine non-native fish species were collected (Gregory and Wildman, Dept of Fish and Wildlife, OSU, 2008). Non-native species included largemouth bass, bluegill, pumpkinseed, western mosquitofish, yellow bullhead, and black crappie. During the April survey, the number of largemouth bass or bluegill was almost ten times greater than any native species encountered (Gregory and Wildman, 2009).

Initial electrofishing surveys conducted by Gregory and Wildman on the newly acquired CARP ponds in 2010 and identified a mix of native and non-native fish species. The native fish species included Prickled sculpin, Largescale sucker, and northern pikeminnow. Oregon Chub or spring Chinook were not found in the ponds during this survey. Non-natives species included bluegill, largemouth bass, gambusia, goldfish, and yellow perch. Further fish surveys of the ponds will be conducted in 2011.

Photo by Roger Robb

Western pond turtle basking beside a nutria in Crescent Lake

2.7.2 Amphibians and Reptiles

The most detailed survey of amphibians and reptiles for Green Island was completed by Paul Adamus in August 2004. The survey was designed to provide an initial and partial inventory of species present and not the relative or absolute population sizes of any one species or abundance with a high level of resolution. The survey does provide a level of baseline information that can be supplemented in coming years and a basic understanding of presence and likely presence of reptile and amphibian species at Green Island. The associated report also includes recommendations for habitat improvements, which have been integrated into the Management Plan.

The 2004 survey used a variety of methods including canoeing through each slough to scan submerged vegetation and water surface for egg clusters; searching under downed logs, rotting stumps, waste lumber, shade cloth, and small rocks for reptiles; walking areas adjacent to sloughs looking for turtle nesting areas; and scanning sloughs for basking turtles.

During the surveys, the presences of nine reptile and amphibian species were confirmed:

Turtle Species: Western Pond Turtle
Snake Species: Gopher Snake; Common Garter Snake
Salamander Species: Ensatina; Roughskin Newt; Northwestern Salamander
Frog Species: Red-legged Frog; Pacific Treefrog; Bullfrog (non-native)

In 2008, two long-toed salamanders were found during fish sampling in the Power Line Pool. Additional species that are likely present on Green Island, based on common occurrence in similar habitats in the southern Willamette Valley, but not yet identified include: Long-toed Salamander; Rubber Boa; Southern Alligator Lizard; Western Fence Lizard; Western Skink; Northwestern Garter Snake; Western Terrestrial Garter Snake; Ringneck Snake; and Racer (also described by local farmer as occasionally seen on Green Island).

Photo by Kit Larsen

Common garter snakes are commonly found along the edge of sloughs and side channels at Green Island.

2.7.3 Birds

The diversity and quality of the habitats found at Green Island results in a wide variety of bird species present including both residents and neotropical migratory birds. A checklist of the birds of Green Island has been developed utilizing a variety of sources including sightings from the historical studies by Paul Adamus and Leroy Fish, historical observations by Kit Larsen and George Grier, and data collected during the 2006-2007 breeding bird survey described below. The Green Island bird list currently stands at 156 species including Osprey, Northern Harrier, Western Meadowlark, Bald Eagle, Black Phoebe, Peregrine Falcon, Gyrfalcon, Pileated Woodpecker, Northern Saw-whet Owl, and White-breasted Nuthatch (see Appendix C).

A comprehensive breeding bird survey of Green Island was conducted on Green Island from April 2006 to February 2007 by local ornithologists Kit Larsen and Roger Robb and is summarized in the Green Island Bird Survey (Summer 2010). As part of this survey, thirty four survey points were established on Green Island. Point count surveys were conducted two to four times per month. Birds were identified and recorded by sight and sound during five minute sessions at each point. General surveys were conducted one to two times per month identifying and recording species, abundance, and behavior.

Photo by Chris Vogel

As part of an Eagle Scout project, 50 nest boxes were constructed and installed on Green Island in 2010.

Based on this study, sixty-three species of birds are suspected of breeding at Green Island with 44 confirmed, 14 probable, and 5 possible breeders. One species, Western Meadowlark, was added to the list of breeding birds for Green Island. A pair was found nesting in the field north of point 11 in the northern portion of the island. Pileated Woodpeckers in an excavated hole in a tree were observed feeding young, confirming breeding for this species. A pair of Black Phoebes that nested in the MRT equipment shed fledged their young in early June 2010.

2.7.4 Mammals

No formal mammal surveys have yet to be conducted on Green Island. However, the following mammals have been visually documented on Green Island by MRT staff, board, and researchers: coyote, Northern river otter, black-tailed deer,

American beaver, common raccoon, camas pocket gopher, little brown myotis bat, brush rabbit, deer mouse, striped skunk, bushy-tailed woodrat, gray-tailed vole, mink, common gray fox, nutria, and feral house cats.

2.8 Existing Facilities and Infrastructure

Constructed facilities at Green Island include a network of graveled roads, a small cluster of out-buildings used for equipment storage, a series of electric lines, several revetments and levees along the Willamette River, and 50 EPA research wells (see Infrastructure and Facilities Map). There are no paved roads or bridges on the site.

Photo by Jeff Krueger

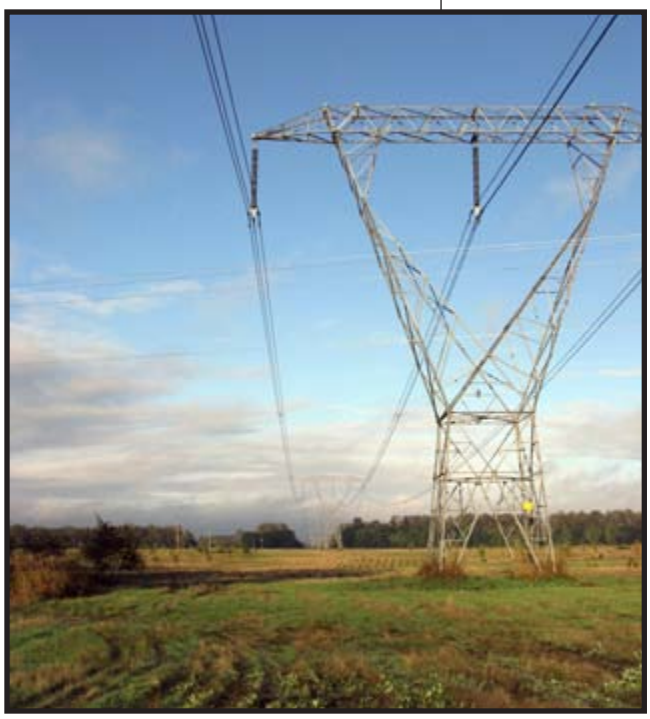
All-season gravel road and gate at the Nexus.

2.8.1 Roads and Travel Lanes

Approximately 4 miles of graveled roadway provide all-season vehicle access onto the MRT property. This includes Green Island Road running from the intersection with Coburg Bottom Loop Road to the low water crossing and access roads to the northern and southern ends of the site. Green Island Road is owned by MRT, with the exception of a short segment crossing the Bixler property, but also provides access to two nearby residences. The access road onto Green Island crosses the historic McKenzie River channel at a *low water crossing*, which has three culverts installed to allow moderate flows to pass under the road. Occasionally the road is cut off at this point during very high river flows, preventing vehicle access to the site. An additional 2.5 miles of lesser quality two-track travel lanes currently exist on the site in various locations, providing seasonal access. A graveled road accesses the newly acquired CARP property from the east, but is not considered a formal access to MRT property since it crosses private property. A total of four locking gates are located on the site including two along Green Island Road to the east of the low water crossing (see *Infrastructure and Facilities Map*).

BPA transmission lines on north side of Green Island

Photo by Chris Vogel



2.8.2 Parking

MRT has two primary gravel parking areas on Green Island. The first is located just to the west of the low water crossing and can accommodate approximately 20 vehicles. The second is located around the MRT out-buildings and can accommodate approximately 40 vehicles. Additional vehicles can be parked in the adjacent grassed area in the dry season as necessary.

2.8.3 Electric Utility Lines

A major BPA transmission line crosses the northern portion of the site and includes five steel pylons located on MRT property. BPA possesses an access easement for repairs and maintenance. Tree planting is restricted under these lines and access to these transmission lines must be achievable at all times for repairs and maintenance. Also present on the site is a network of Em-

erald People's Utility District (EPUD) electrical lines, which provide power to a series of wells used for seasonal irrigation.

2.8.4 Levees, Berms, and Revetments

Based on USACOE reports (USACOE, 1975), aerial photo interpretation, and property records, several hardened revetments and levees were constructed on the site following the 1964 flood (primarily in the mid to late1970s) in an attempt to combat flooding and further river migration. Little information exists about the exact construction dates or the standards used during construction. At the time of MRT purchase, a total of 13,200 lineal feet of levees and flood control berms existed on Green Island. In 2007 and 2009, MRT removed all of the levees and berms located on the northern half of the site, totaling approximately 5,600 lineal feet. The remaining levees/berms include a short levee segment at the nexus, a much longer segment along the agricultural fields on southern half of the site, and several roughly graded berms on the eastern side of the historic McKenzie River channel, at the northern end of Green Island near Confluence Pool, and around the small excavated pond adjacent to Gallery Island. Remaining berms and revetments total approximately 8,100 lineal feet. The two revetments located along the Willamette River, total approximately 4,050 lineal feet appear to be failing in several locations. Additional revetments are located along the Willamette River and historic McKenzie River channel in close proximity to MRT property and are shown on the Infrastructure and Facilities Map.

Photo by Jeff Krueger

2010 levee removal area with riparian plantings viewed from the Willamette River

2.8.5 EPA Research Wells

A total of 50 shallow ground water monitoring research wells were installed on MRT property in 2008. The majority of the wells are located parallel to the Willamette River, with a few additional wells dispersed around the site. These wells will be utilized by EPA for an extended period of time. Two of these wells are known to have been lost during the January 2011 flood event.

2.8.6 Structures and Staging Areas

A cluster of several out-buildings located near the center of Green Island provide approximately 5,000 square feet of storage. A small pump house is present and provides water for management activities. This area is also used for hosting events as a staging area for projects. Another staging area is located on the northern half of the site and is used for temporary storage of equipment and nursery plants. The area on either side of the road just to the east of the low water crossing is also used temporary storage of project materials such logs, root wads, and boulders.

Photo by Jeff Krueger

MRT out-buildings

Photo by Raptor Views

The remains of the abandoned ferry on the historic McKenzie River channel

2.8. 7 Historic Ferry Crossing
Prior to the 1964 flood, Green Island was accessed via a ferry, which crossed the McKenzie River. At the time, the McKenzie River flowed along eastern edge of Green Island. When the river migrated southward, the ferry was no longer needed to gain access to the island and abandoned. The ferry and associated cables still remain in place and serve as a reminder of the dynamic nature of the river (see section 2.2 for more information on the ferry crossing).

2.9 Ongoing Research on Green Island
Green Island is currently being utilized as the site for three major research projects:

- *Coldwater Refugia* – Oregon State University (Gregory and Wildman, Dept of Fisheries and Wildlife)
- *Hydrology and Nutrient Dynamics* - USEPA (Ground Water and Ecosystem Restoration Division)
- *Effects of US Army Corps of Engineers Willamette Projects Operations on Oregon Chub and Other Floodplain Fishes* – ODFW (Bangs, Scheerer, and Jacobs)

2.10 Adjacent Land Uses and Zoning
Green Island is situated well outside of existing city limits and urban growth boundaries, so nearby land uses and zoning designations are predominantly resource related (agriculture and sand and gravel). A mix of agricultural land in active production and undeveloped lands with varying amounts of tree cover surround Green Island on all sides. A few residential structures are located adjacent to Green Island to the east on parcels zoned for rural residential. A significant area of land located to the southeast of Green Island and adjacent to the McKenzie River is zoned for sand and gravel extraction, but is not currently being used for that purpose.

2.11 Enhancement Activities Completed 2005-2011
Since MRT began acquisition at Green Island in 2003, significant enhancement activities have been implemented including tree and shrub planting, levee removal, invasive species control, and side channel reconnection. Major enhancements are described below:

2.11.1 Tree and Shrub Planting
Each year since 2005 has seen significant areas of native trees planted at Green Island in support of the long-term goal of restoring a diverse native floodplain forest. Initial tree planting efforts have been focused in the northern half of Green Island where agricultural uses are being phased out and where levees have been removed. As of early 2011, a total of 246 acres have been planted

with approximately 54,000 trees. As the trees mature, supplemental plantings will occur throughout this area, including additional trees and understory species.

In the agricultural fields, trees have generally been planted in rows 11 feet wide with spacing of 15 feet, which translates to a density of approximately 250 trees per acre. The rows enable mowing to occur and also provide access for irrigation equipment during establishment. In areas that had previously been planted with a corn or wheat crop, a low diversity mix of aggressive native grasses is typically introduced prior to tree planting as a way to limit weed invasion and prevent soil erosion. In the agricultural areas that already had a grass crop in place, the trees were planted without addition of a native cover crop. The grasses are seen as a temporary ground cover, which will be replaced over time by a native understory. Trees have also been planted in several areas where disturbances, such as levee removal or invasive species control, have occurred. Typical planting density in these areas was slightly higher, with tree spacing averaging approximately 8 feet on center. All tree plantings include placement of mulch mats and shade cloth to help hold water and limit competition and tubes to provide browse protection. Voles have taken a heavy toll on the survival rates of the initial plantings and enhanced browse protection will be used for future plantings.

Photo by Chris Vogel

Volunteer tree planting (October 2008)

Mowing and irrigation schedules in the areas planted with trees varied depending on the location and age of the trees. Typically, surface irrigation is performed three times during the dry season (June-Aug) for two seasons after planting. In the areas where access is limited, irrigation has been done with a mobile drip system. Mowing around the trees is performed on an annual basis as a way of limiting seed production, competition, and fire danger. In areas with limited access for mowers, grass is generally controlled with weed eaters. All mowing is timed to limit impacts to ground nesting birds.

Photo by Chris Vogel

Northwest Youth Corps blackberry control project (2010)

2.11.2 Invasive Species Control

Since the 2003 acquisition of Green Island, MRT has been conducting invasive species control across much of the non-agricultural portions of the site including riparian forest, along side channels and sloughs, and islands. Target species have included spotted knapweed, Japanese knotweed, blackberry, shining geranium, clematis, tansy ragwort, Scot's broom, and jimson weed. Methods have included herbicide application, hand pulling, and cutting. All herbicides

and applications used are approved under the *Endangered Species Act Section 7 Formal Programmatic Consultation and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation for the Implementation of the Bonneville Power Administration Habitat Improvement Program in Oregon, Washington, and Idaho*, CY2007-CY2012 (HIP II).

2.11.3 Cherry Orchard Removal Project

A 16 acre cherry orchard in the southern portion of the property was planted sometime between 1986 and 1990 bases on aerial photographs. Since MRT ownership, Detering Orchards managed and harvested the cherries in a year to year lease agreement. July 2008 was the last harvest for Detering Orchards. Due to the age and health of the trees, they were no longer viable for market harvest. In addition, the presence of a commercial cherry orchard was not consistent with long-term restoration goals for the site.

Photo by Chris Vogel

Cherry orchard removal

The orchard was removed in 2009 and the area was planted with riparian trees in January 2011. Cherry trees were cut and the stumps were ground and sprayed to allow for follow-up mowing and to prevent re-sprout. The trees were chipped and the wood was hauled off site and utilized as a charcoal additive by a local company. In an attempt to increase the survival rate of tree plantings in this area, a moisture retention product (TerraSorb), mulch mats, and vole browse guards were utilized. If successful, this technique may be used on future plantings.

2.11.4 Douglas-fir Stand Improvement Project

A three acre Douglas-fir stand, approximately 30 years in age, is located in the southern portion of the site. It is thought that the trees were planted for timber or Christmas trees. The trees were planted approximately 15 feet apart, with a total of 246 trees and had significant blackberry growth around the perimeter. Due to the thick canopy, little light was allowed to reach the ground, limiting growth of understory species and the trees lack healthy crown ratios. In 2008, MRT mowed blackberries surrounding the stand. In January 2010, the stand was assessed by retired ODF forester Tom Mickel, who recommended the stand be thinned to promote healthier growth and a native understory. The trees were thinned later in 2010 and will be assessed for further follow-up treatment including additional thinning and introduction of a native understory. The material from the thinning will be used from in-stream habitat projects.

Photo by Jeff Krueger

Trees removed from Douglas-fir stand (will be used for habitat elsewhere on the site)

2.11.5 Poplar Orchard Removal

Hybrid poplars had been planted by the previous owner on approximately 17 acres on the southern half of Green Island several locations including a portion of the agricultural field, around the small borrow pit, and in openings in the riparian forest. The trees were likely planted for pulp or timber production. Because hybrid poplars are genetically altered and may be backcrossing with native cottonwoods in the nearby riparian forests, it was determined that they were inconsistent with restoration goals for the property. In 2007, all 17 acres of hybrid poplars were removed and will be replaced with native riparian tree and shrub species in the coming years.

2.11.6 Crescent Lake Enhancement

A former side channel of the Willamette River, Crescent Lake had become hydrologically disconnected from the main river due to a plug of sediment and/or fill on the north end and a levee on the south end. The goal of this project was to increase connection duration with Willamette River to provide more off channel habitat to native fishes and to promote nesting and basking habitat for Western pond turtles. This project was implemented in 2008 using funding provided by a grant from Pacific Salmon Commission and funds from the Trout Unlimited Chapter 678, with technical assistance from USFWS.

Photo by Chris Vogel

2008 Crescent Lake enhancement project

The project included the removal of approximately 500 cubic yards of soil that formed the plug at downstream end of channel, re-contouring 1,600 lineal feet of bank to a 5:1 slope, blackberry removal, and planting of native grasses (blue wildrye and meadow barley) and 250 native trees and shrubs. In addition, 37 large logs were placed to enhance fish habitat and provide basking structure for Western pond turtles. Pre- and post-monitoring of this project was completed by OSU Department of Fisheries and Wildlife students and researchers.

2.11.7 Large Wood Placement

In addition to the large wood placement in Crescent Lake described above, MRT placed additional large wood in 2008 including 7 logs in the historic McKenzie Channel (on Powerline Pond) and 13 logs in the Willamette River side channel on the south side of Green Island. In 2010, an additional 20 logs and 12 root wads were placed on the Willamette River side channel just downstream of the nexus area. The goal of the large wood placement is to improve habitat conditions for native fish species including Chinook salmon and Western pond turtle.

Photo by Jeff Krueger

Large woody debris placed in Willamette River side channel at Green Island in 2008

Photo by Chris Vogel

2009 levee removal project

2.11.8 Levee Removal

In 2007 and 2009, approximately 5,600 lineal feet of levees were removed from the northern half of the site. The goal of this project was to aid in floodplain connection and allow for more frequent flooding from the Willamette River and historic McKenzie River channel during high flow periods. It is estimated that the removal of the levees will allow flooding to occur in this area on approximately a 3 to 8 year interval. On January 17, 2011, the Willamette River inundated the north floodplain where the levee once stood. Additional levee removal is planned for the southern half of Green Island in the coming years.

2.12 Public Access and Use

Since the initial MRT acquisition of the site in 2003, public access to Green Island has been limited and has consisted primarily of tours for interest groups, access for research or education, and for special events such as tree plantings or celebrations sponsored by MRT. Illegal access has been an issue since acquisition and has included trespass for hunting, fishing, crop theft, and ATV use. MRT is using a multi-tiered approach to reducing trespass including outreach to neighbors, access management, and enforcement.

Public facilities such as trails, signage, restrooms, and shelter are currently limited or do not exist on Green Island. MRT has intentionally chosen to make habitat enhancement and floodplain restoration the top priority for the site over the first decade of ownership, consistent with stipulations in the acquisition funding agreements and conservation easements. However, these agreements do not prohibit the possibility of public access and use in the future as long as it is not in conflict with the habitat conservation and enhancement goals for the site. MRT will be considering options for additional public use in the future (see Section 5.0, goal 6).

3.0 Constraints and Opportunities

The following list of constraints and opportunities have been identified for Green Island and were used to shape the proposed restoration and management actions included in this plan.

3.1 Hydrology

Constraints:

- River flows at Green Island are greatly affected by upstream flood control dams. Flood events are much less intense and less frequent than pre-dam conditions.
- Existing levees and revetments limit natural floodplain and channel function and migration.
- MRT ownership does not fully correspond to hydrologic boundaries of some features such as side channels and floodplains, making management challenging in some areas.

Opportunities:

- Green Island is situated within the highly dynamic confluence area of the McKenzie and Willamette Rivers and presents one of the best remaining opportunities within the Willamette Valley for preserving and restoring a dynamic and ecologically diverse river system on a large scale by allowing the river to inundate and migrate across a relatively large floodplain.
- The Green Island 2-dimensional hydraulic model developed by DHI has provided a better understanding of the patterns of channel and floodplain flow that occur at the site under a variety of high flow events. Integrating new data and refining the model will allow for further hydrologic and restoration analysis.
- The EPA's ground water and surface hydraulic models will provide an understanding how ground water and surface water from the Willamette and McKenzie River influence ecological processes on the site.
- The revetments (owned by MRT) along the Willamette River edge of the site are failing in several locations due to natural river migration. This will ultimately allow the river to migrate into the adjacent floodplain areas on the site.
- The CARP area presents a great opportunity for side channel enhancement within the historic McKenzie River channel. The TNC/USACOE *Sustainable Rivers Project* provides an opportunity to coordinate investments in activities with ecological flows from the dams.

3.2 Habitat

Constraints:

- The shrub and herb components of most habitats are dominated by exotic and invasive species. Perennial rye grass, Armenian blackberry and reed canarygrass are the most widespread exotic species currently present and occur in dense thickets across much forested portions of the site, along side channels, and agricultural fringes.
- The continual input of weed seeds brought in by flooding, birds, and other wildlife has resulted in extensive colonization of invasive plant species across Green Island.
- Some recently arrived aggressive invasive species have the potential to rapidly colonize habitats. These include Bohemian, Japanese, and giant knotweeds, false brome, traveler's joy, and shining geranium.
- Relatively little quantitative baseline vegetation data has been gathered for the site beyond the 2005 *Inventory and Assessment of Vegetation and Restoration and Management Recommendations for Green Island* (Salix Associates).
- Areas of recent disturbance at the CARP site (prior to acquisition) are prone to invasive species colonization. Lack of top-soil in these areas makes re-vegetation challenging.
- Large woody debris, which is known to be essential for fish, reptile, and amphibian habitat, is lacking in some areas of the site, although considerable large wood placement has occurred in recent years.
- Nectar producing native forbs, on which on which many insects depend, are very limited on the site.
- The extensive reed canarygrass mats that have formed along the historic McKenzie River channel tend to collect sediment, which could eventually limit flows along this channel.
- The steep banks on the edges of the gravel pit ponds limit the ability for riparian and wetland vegetation to establish.

Opportunities:

- Strategic acquisition of easements and land adjacent to Green Island could further protect key habitats and present greater opportunities for large scale habitat enhancement.
- A diversity of native grasses and forbs could be introduced into the prairie restoration areas of the site including many nectar producing species.
- A portion of the agricultural lands on the south side of the property could potentially be used for agricultural grow-

out of native grasses and forbs to support restoration activities both on the Green Island site and elsewhere in the region. This would be an ideal transition, which could easily be phased into native habitat in the future.
- The side channels and backwater areas of Green Island have great potential for providing habitat for Western pond turtles, which are known to already exist in pockets on the site. Additional understanding where they nest could also assist in management activity timing and methods.
- Because trees and large shrubs are not permitted direly under the BPA or EPUD electric lines, these areas could be planted with native prairie species, creating diversity of habitat across the site.

3.3 Wildlife

Constraints:

- Non-native bull frogs, which are known predators of native juvenile fish and turtles, currently exist in the waterways and ponds across the site.
- Non-native fish species included largemouth bass, bluegill, pumpkinseed, western mosquitofish, yellow bullhead, gambusia, goldfish, yellow perch, and black crappie are found in the gravel pit ponds and isolated side channels across the site. These species negatively impact native fish species through predation and competition.
- The expansive vole population present on the site makes establishing prairie and riparian trees and shrubs challenging. Voles can eat native seed before it germinates and often girdle young trees and shrubs.
- Deer browse and damage plantings often causing mortality.

Opportunities:

- Non-native fish populations that are currently found on site could be significantly reduced through planned habitat modifications such as reconnection of side channels and gravel pit ponds.
- Incorporating plant protection methods may increase plant survival.

3.4 Access and Facilities

Constraints:

- The extensive network of road and travel lanes present on site requires ongoing maintenance.
- Although MRT holds an easement for access on the Green Island Road, several residents access their properties from this gravel road and have ongoing road maintenance expectations of MRT.
- The main entrance gate is often left unlocked and open during the day, which can lead to intentional and unintentional trespass and possible entrapment of vehicles. The "daisy chain" of locks at the main entrance gates are often improperly strung together when locked, often preventing access by utilities and others.
- Illegal vehicle and ATV access occurs on the site. Access is being gained from adjacent private properties to the east or from the main access road.
- The low water crossing over the historic McKenzie River channel is occasionally inundated during flood events, preventing access to much of the site. This crossing must also be reconstructed on a regular basis to re-set the culverts and re-surface the road. All season access to the site for emergency utility maintenance is critical.
- The access road that crosses the nexus from the southern to northern half of the site sits on top of a short levee segment, blocking water flow from the Willamette side channel and the historic McKenzie River channel.
- Vehicle and equipment access onto the site for maintenance and management activities is difficult or not possible in some areas. This includes the Willamette River islands and bars, many of the heavily forested areas along the waterways, and the area around Hileman Park on the west bank of the river.
- Property boundary signage is currently limited to the main road, which may contribute to unintentional trespass.
- Under the existing agricultural lease, access for farming activities will need to be accommodated for the next several years and are not compatible to public use.
- Portions of the property are adjacent to public lands (county, state, and federal); presently there is no signage or clarification of MRT ownership.
- Ecological (prescribed) burning may be a useful management tool for the site, especially for the prairie habitats. Burning, however, is typically not permitted under BPA power lines, which cross a significant portion of the site's prairie habitat.

Opportunities:

- The network of all-weather roadways on Green Island provides good access to much of the site for maintenance, research, and enhancement projects.
- An extensive network of wells and associated irrigation infrastructure are already in place on Green Island and can be

used to support restoration activities such as tree and shrub planting and fire suppression for wildfires and ecological burns.
- The two designated graveled parking areas located on the site provide parking for events and activities such as volunteer work parties or tours, with much more parking possible during the dry season.
- Access and recreational use on the west side of the Willamette River through Hileman Park (Lane County) could be developed and enhanced.

3.5 General Public Use

Constraints:

- Active farming and restoration activities currently make general public access to the site impractical and potentially dangerous.
- Without staffing and proper facilities, opening the site to general public access could result in natural resource impacts, public safety concerns, theft and possible liability issues for the property owner.
- The *Green Island Conservation Easement* states that "all actions necessary to ensure that the property is used and managed in a manner consistent with the Conservation Values" (see Section 1.4 for list of Conservation Values).
- The Green Island Conservation Easement *prohibits* the following recreational related activities:
    - Operation of motorized off road vehicles such as snowmobiles, dune buggies, all terrain vehicles or motorcycles, except as may reasonably be used in managing the property consistent with its Conservation Values.
    - Shooting of firearms, guns, rifles, for professional or recreational purposes, unless specifically to promote Conservation Values.

Opportunities:

- MRT supporters could potentially be recruited and trained serve as volunteer docents or interpreters who could lead field trips of Green Island.
- The system of roadways now located on the site could easily function as trails with little modification if public use were to be permitted over the long-term.
- In 2006, the *Upper Willamette River Water Trail* was officially designated and passes by Green Island. Green Island is situated to potentially serve as a location for a primitive camp site along this route.
- Numerous easily accessible river vista points are located on Green Island, providing an outstanding visual resource to visitors.
- Special limited hunting and fishing opportunities could be created to public groups (e.g. Ducks Unlimited, Oregon Hunter Association, ODFW youth programs, Boy/Girl Scouts) providing provide revenue for restoration and site management.

3.6 Education and Research

Opportunities:

- Green Island will serve as a *demonstration project* for large scale floodplain and habitat restoration that can be used as a model for other similar sites in the future.
- Green Island offers abundant opportunities for environmental education and interpretation focused on riparian, riverine, and prairie habitats, wildlife, water resources, and restoration methods.
- Green Island offers abundant opportunities to serve an outdoor laboratory for research on topics such as river morphology, water quality, wildlife, and habitat restoration and enhancement techniques.
- The 50 EPA research wells that are already in place on Green Island represent a significant federal investment and could be used for additional long-term studies on water quality and hyporheic flow.
- The abandoned ferry that was once used by the Green family to cross the McKenzie River could be used to help interpret the history of the site and serve as a reminder of the dynamic nature of the river system.
- Extensive baseline information on the presence and relative abundance of birds has been collected on Green Island. This, combined with future data, could be used to evaluate the impact of the restoration and enhancement projects relative to birds.
- The fish population data that has been collected from the side channels and gravel pit ponds in recent years will provide useful baseline data for assessing the impacts of restoration activities in the future.
- The acquisition of Green Island and the ongoing restoration and enhancement activities are a crowning achievement for MRT and serves as a valuable asset to the organization in terms public outreach and fund raising for future projects.

4.0 Desired Future Condition

The Green Island Vision

The Green Island Vision, as described in Section 1.3, was created as a component of the *Interim Management Plan* (2005) to provide a vivid picture of the desired future condition for the site. The *Green Island Technical Team* carefully crafted this vision to be consistent with the parameters specified in the MOU between BPA and MRT (see Section 4.1). The Technical Team also developed a set of guiding principles, which were intended to complement the vision and help direct future management approaches and decisions (see Section 4.2).

4.1 Desired Future Condition Specifications

As specified in the MOA between the BPA and MRT (Trust BPA 2010 MOA, Section IV A. 2.), parties agree that the Desired Future Condition of any acquisition is as follows:

- At a minimum it maintains existing fish and wildlife habitats in condition as shown in the Baseline Documentation Report prepared for the property.
- Natural regeneration occurs where such regeneration is appropriate and consistent with the identified conservation values.
- Native, habitats with attributes historically typical of the Willamette Basin prior to non-Indian settlement, including a mix of floodplain forest, oak woodland/savanna and upland prairies.
- With noxious weeds controlled to the extent reasonably possible to maximize the property's conservation values.

4.2 Guiding Principles

The following guiding principles were established by the *Green Island Technical Team* to help direct management approaches and decisions:

- Maintain good communication with our stakeholders.
- Be efficient and cost-conscious.
- Emphasize partnerships and cooperation.
- To restore the site to its desired condition, both active and passive restoration will be required.
- A flexible and adaptive approach that will respond effectively to opportunities and challenges.
- Successful restoration and management may require balancing competing needs of a robust ecosystem.
- Restore natural processes.
- Strive to use best management practices, including those that emulate natural processes.
- Successful restoration and management may require blending standard techniques, a scientific approach, practical knowledge and experimentation to arrive at what works best.
- Restoration will emphasize an approach that will limit annual management costs.
- Until the potential for human impact on the site is understood, public access will be limited.
- Comply with all regulatory requirements.

Photo by Tim Giraudier

Canada goose using an abandoned osprey nest at Green Island

5.0 Goals, Objectives, and Actions

5.1 Overview

The purpose of this section is to provide direction for the short- and long-term management and enhancement of Green Island related to hydrology, plant communities, habitats, and facilities that are consistent with the site's conservation values (right) and responsive to the constraints and opportunities that have been identified in Section 3.0. The *Green Island Vision*, described in Section 1.3, is an illustrative portrayal of the desired future condition for the site. The goals, objectives, and actions listed on the following pages articulate how this vision will ultimately be achieved. The content of the *Green Island Interim Management Plan* (May 2005, updated in 2009) was used as a starting point and was expanded upon and reorganized under the following categories:

- Hydrology
- Habitat Management
- Monitoring and Mapping
- Education, Research, and Public Use
- Operations and Maintenance

Because necessary funding to achieve the full vision as described is currently limited, higher priority actions have been identified to focus immediate action (see Section 6). Lower priority actions will be implemented over time as additional funding is secured. It is also hoped that this plan will also serve as a model for other similar river floodplain areas in the Willamette Valley.

Each of the nine goals listed below is supported by a set of objectives, which describe how the goal will be attained. Each of the objectives includes a set of more detailed Actions, which describe how the objectives will be implemented. Due to the range in condition of this site's habitats, a degree of latitude has been written into the plan to allow for flexibility that responds to localized conditions, availability of funding, and adaptive management.

5.2 Adaptive Management Approach

The McKenzie River Trust strives to utilize an adaptive management approach at Green Island. Under this approach, major management actions are evaluated as implementation occurs and future actions and priorities may be adjusted accordingly to improve future success. To successfully utilize the adaptive management approach, pre- and post- project conditions are recorded and techniques and the geographic extent of major enhancement and management activities are carefully documented.

The actions described on the following pages will be evaluated using the adaptive managment approach as implementation occurs and may be adjusted accordingly.

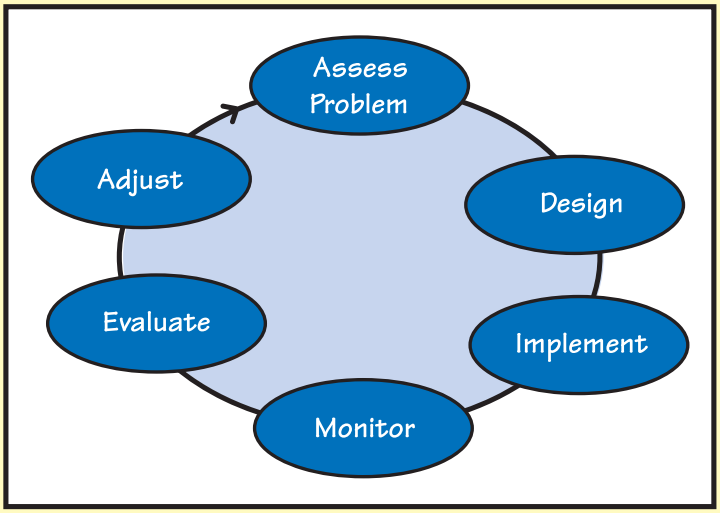
Conservation Values

As specified in the BPA Green Island Conservation Easement (2004), it is the purpose of the easement to retain the conservation values of Green Island by protecting its natural resources, maintaining or enhancing air or water quality, and preserving its underlying archaeological or cultural resources in perpetuity, and preventing any use of Green Island that will impair or interfere with the conservation values of Green Island. The conservation values include the following:

- *Anadromous fish and their habitat, including the riparian and upland habitats that affect instream habitat*
- *Resident fish and wildlife and their habitats*
- *Historical and cultural resources*
- *Water quantity and quality including temperature, sediment load, and flow levels*

Adaptive Management Process

The diagram below shows a six-step cycle that is typical of an adaptive management approach.



5.3 Hydrology

Goal 1: Hydrology
Enhance natural hydrologic processes on Green Island including flooding, channel migration, groundwater interaction, and formation of backwater areas to the extent practical.

Objective 1a. Eliminate barriers that currently limit natural floodplain interaction and inundation on Green Island, while assessing changes to ensure that potential negative impacts to nearby properties is avoided. Constructed barriers such as berms, levees, and revetments currently limit natural river processes from occurring on the site.

- Action: Remove the existing flood control levee/berm located along the southern edge of Green Island (approximately 6,000 lineal feet). This will allow natural floodplain inundation to occur within the network of swales and upper terrace area on the southern half of Green Island during high flow events (3-yr flood interval).
- Action: Remove the road fill from the swales on the southern half of Green Island adjacent to the Willamette River and Gallery Island in five locations to allow natural interaction between the swales and the river floodplain.
- Action: Re-contour the small gravel pit pond near Gallery Island to provide a connection to the adjacent Willamette River floodplain and to create gradual vegetated slopes.
- Action: Install a fish passable structure (e.g bottomless box culvert or bridge) under the levee at the nexus channel to allow floodwaters to move between the Willamette River and the historic McKenzie River channel

Willamette River at Green Island with active side channels, gravel bars, and large woody debris accumulation

Photo by Raptor Views

Central portion of Green Island (looking southeast)

during high flows. The gravel road on top of the levee will be retained to accommodate access to the northern half of Green Island.

- Action: Remove fill material at west end of the nexus channel to facilitate increased connectivity between the Willamette River and the historic McKenzie River channel.
- Action: Improve the current "low water crossing" of the historic McKenzie River channel for enhanced flow and fish passage. Current design is to install bottomless box culverts (approximately three) to accommodate seasonal flows while facilitating year-round access site along the primary access road.
- Action: Remove the berms that have been constructed around the CARP ponds during the mining operation. This will allow seasonal side channel flow to move through that area once again. This will be done in conjunction with the planned restoration and reclamation of the gravel ponds (see section 2.4.4 for preliminary concept).

Objective 1b. Allow natural channel migration to occur on and around Green Island. A dynamic river system supports formation of aquatic habitat by continuously carving new side channels, building sheltered alcoves, creating pools, toppling trees, forming gravel bars, and pushing sediment downstream.

- Action: Allow the degradation of the revetments located along the Willamette River on the western edge of Green Island to continue and consider removal of selected segments to help facilitate the natural process of river migration along this edge. River migration in these areas will be monitored over time to ensure that negative impacts to adjacent properties that could arise from this are avoided (current modeling predicts impact to adjacent properties is unlikely – see section 2.4.4).

Photo by Jeff Krueger

The Ferry Pool near the Nexus

- Action: Work with adjacent public and private land owners to limit installation and repair of armored banks or revetments near Green Island (where possible) to allow natural river migration to continue to occur in the broader confluence area as feasible.
- Action: Reconnect the historic McKenzie River channel that flowed through the CARP area prior to the aggregate mining operation. This will be facilitated during the planned restoration and reclamation of the ponds (see section 2.4.4 for preliminary concept).
- Action: Assess side channel areas that have become choked with large concentrations of reed canarygrass and other non-native vegetation to determine if the vegetation and trapped sediments are building up to the point of blocking seasonal flows. Where blockage is occurring, consider deepening the channel bottom to promote better flow and to create hydrology that is too wet for reed canarygrass. This would be done initially on an experimental basis on a small scale.

Objective 1c. Continue to study the complex relationship between sub-surface hyporheic flows and surface water in the rivers and side channels on and around Green Island as they relate to recharge and water quality and utilize results to inform future management decisions.

- Action: Assess and utilize the results from the ongoing groundwater studies being conducted on Green Island by EPA, ODFW, and OSU to inform future management decisions.
- Action: Continue to allow Green Island to be utilized for research related to hyporheic flow and water quality as a way of help better inform land use and management decisions related to Willamette Valley waterways.
- Action: Complete the inundation duration analysis of the site, tying expected inundation elevations to historic flows recorded at the Harrisburg gauge (currently underway).

Objective 1d. Coordinate with the Sustainable Rivers Project that is now currently underway, sponsored by the Corps of Engineers and The Nature Conservancy. This effort is evaluating flow requirements on the Willamette River system that will restore and maintain river and floodplain habitat and water quality conditions for a variety of target species. This study will ultimately result in modifications to dam releases to mimic a more natural hydrologic condition and river temperatures, and could greatly benefit sites such as Green Island.

- Action: Coordinate with partners including the Corps and The Nature Conservancy and allow Green Island to be utilized as a test site to help assess impacts of various dam releases to natural systems.

5.4 Habitat Management

Goal 2: Protect and Enhance Established Native Vegetation Communities
Protect and enhance established native plant communities on the site within the broader context of Willamette River riparian ecosystem restoration and in a way that is consistent with the site's established conservation values (anadromous fish and their habitat, including the riparian and upland habitats that affect instream habitat).

Objective 2a. Protect and enhance the established riparian plant communities where they currently exist on the site totaling approximately 280 acres. Enhancements will be achieved through targeted weed control and supplemental plantings of native riparian trees and shrubs. [Refer to areas coded R1 on Desired Future Habitat Conditions and Management Actions Map]

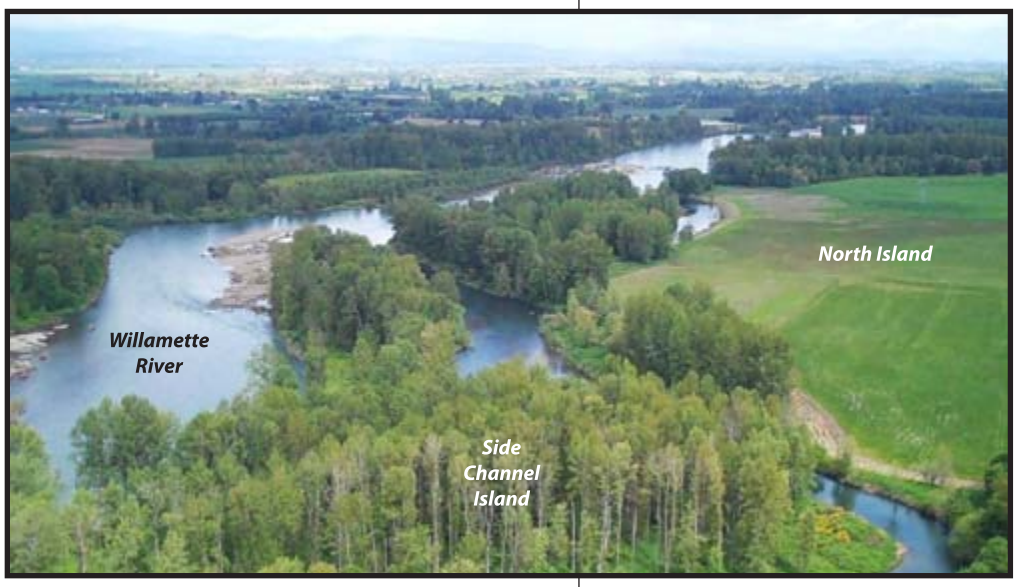


Photo by Raptor Views

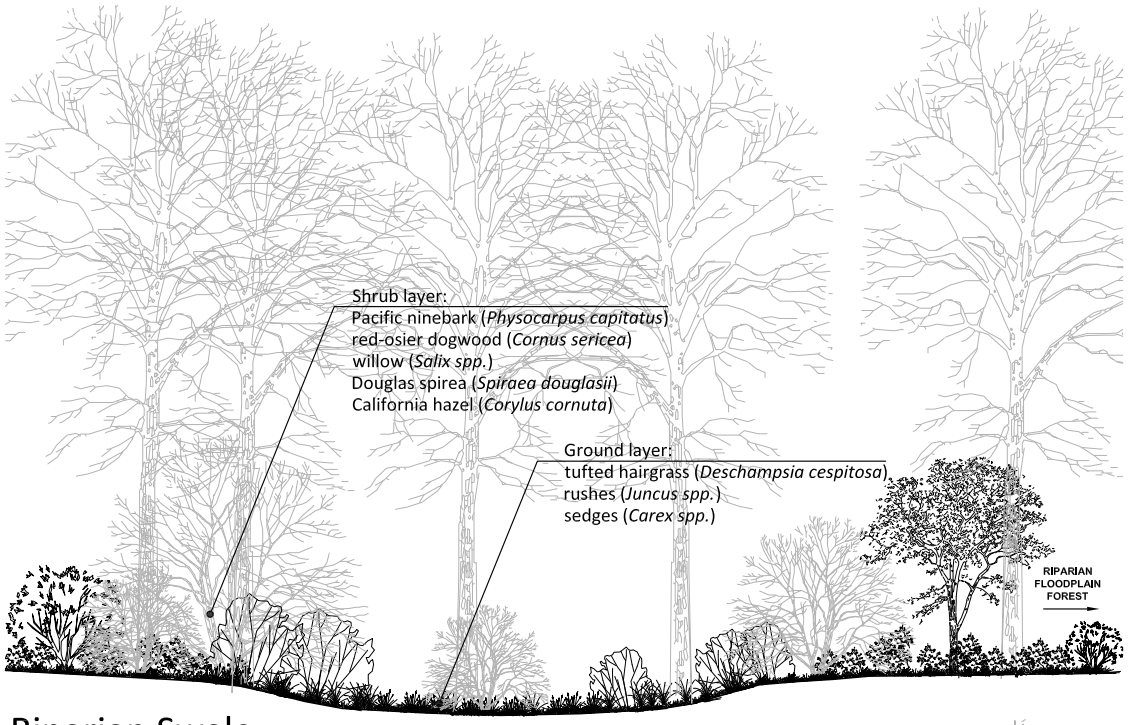
Established riparian forest (R1) on Side Channel Island

- Action: Control the most aggressive invasive weed species that have high potential for rapid spread. At Green Island, these include Bohemian, Japanese, and giant knotweed, Scot's broom, false brome, English ivy, traveler's joy, and butterfly bush. High priority areas for weed control include Gallery Island, Side Channel Island, the nexus, and riparian areas that lie immediately adjacent to restoration projects.
- Action: Ensure that no new highly invasive weed species are establishing within the riparian zones on Green Island. New threats will be identified through a combination of weed monitoring and mapping activities and coordination with other natural area managers in the region. Establishing populations of new highly invasive species will be targeted for eradication as feasible.
- Action: Establish native trees, shrubs, and grasses where cover is lacking, focusing on areas immediately adjacent to the river and side channels and in areas where major invasive species control projects have occurred.

Objective 2b. Preserve and enhance the existing patch of coniferous forest totaling approximately 3 acres to provide habitat diversity within the much larger riparian forest that will dominate the site in the future. [Refer to areas coded C1 on Desired Future Habitat Conditions and Management Actions Map]

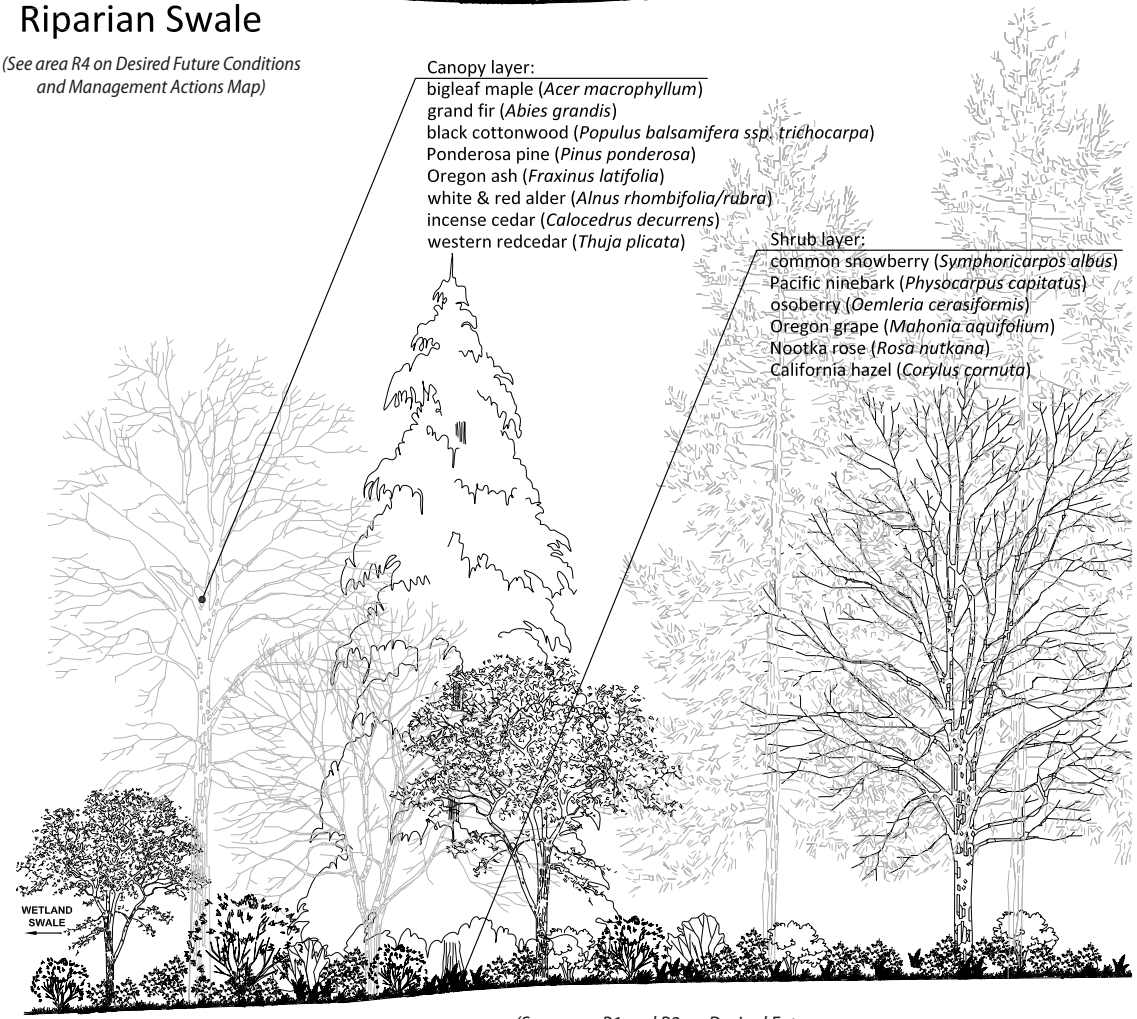
- Action: Thin the existing Douglas-fir stand to allow adequate light to reach the forest floor to support native understory species. Removed trees will be used elsewhere on-site habitat enhancement projects.
- Action: Establish a native understory in the by introducing species such as snowberry (*Symphoricarpos albus*), Oregon grape (*Berberis aquifolium*), osoberry (*Oemlaria cerasiformis*), and sword fern (*Polystichum munitum*).

Riparian Swale and Riparian Floodplain Forest Cross Sections



Riparian Swale

(See area R4 on Desired Future Conditions and Management Actions Map)



Riparian Floodplain Forest

(See areas R1 and R2 on Desired Future Conditions and Management Actions Map)

Source: Ryan Ruggiero (MRT)

- Action: Diversify the forest stand by introducing additional tree species such as grand fir (*Abies grandis*), incense cedar (*Calocedrus decurrens*), and bigleaf maple (*Acer macrophyllum*), and vine maple (*Acer circinatum*).

Objective 2c. Preserve and enhance river side channels and their associated native aquatic and riparian vegetation. Side channels are critically important for the lifecycles on numerous native fish, amphibian, and reptile species.

- Action: Establish native trees and shrubs along the edges of the side channels and ponds where currently lacking to provide shade and cover. Species to be planted in this edge habitat include willow (multiple species), creek dogwood, Douglas spiraea and slough sedge.
- Action: Ensure that no new invasive aquatic plant species are establishing within the river side channel, pools, or ponds. Non-native species with high potential to rapidly expand if established include yellow floating primrose willow (*Ludwigia hexapetala*), Eurasian watermilfoil (*Myriophyllum spicatum*), and yellow-flag iris (*Iris pseudacorus*). All of these species are known to be present on nearby sites.
- Action: Attempt to control highly invasive aquatic vegetation that has already established on Green Island including Parrot feather (*Myriophyllum aquaticum*) and crisp-leaved pondweed (*Potamogeton crispus*) to prevent further spread as feasible.
- Action: Identify and preserve exiting populations of native floating, submersed, and emergent plant species including pondweeds (*Potamogeton* spp.), water starworts (*Callitriche* spp.), sedges (*Carex* spp.), flatsedges (*Cyperus* spp.), rushes (*Juncus* spp.).

Photo by Jeff Krueger

Riparian tree planting adjacent to historic McKenzie River channel

Goal 3: Re-Establish Native Vegetation

Re-establish a diversity of native vegetation communities on agricultural lands and other disturbed areas. Agricultural practices have significantly displaced native vegetation communities through much of the valley bottom including large areas of Green Island. Riparian forest, which mimics the historic condition, will be the primary target habitat, but additional types such as prairie and savanna will also be incorporated in suitable areas to provide diversity and to create ecologically diverse edge habitats (ecotones).

Objective 3a. Establish riparian forest on the agricultural lands and other disturbed areas of Green Island, totaling approximately 450 acres. Initial tree plantings have already completed in phases on much of the northern half of the site and a portion of the southern half. [Refer to areas coded R2 on Desired Future Habitat Conditions and Management Actions Map]

- Action [year one]: Establish a dense native grass cover crop on agricultural lands as they are phased-out of production and on disturbed areas to help limit weed establishment and prevent erosion. Grass species will include blue wildrye, tufted hairgrass, California oatgrass, Roemer's fescue, tufted hairgrass, and California brome. Avoid ground disturbing activities such as tilling where possible to limit weed invasion.

- Action [years one to five]: Plant a diversity of native riparian tree species at an approximate density of 250 trees per acre. Tree species mix will be specified based on local site conditions and will include species such as black cottonwood, ponderosa pine, bigleaf maple, incense cedar, Oregon white oak, red alder, Oregon ash, grand fir, and western redcedar.
- Action [years five to fifteen]: Following successful establishment of tree cover, introduce a variety of native riparian understory species to the riparian forest. Planting will be done in clusters to allow for easy irrigation and follow-up monitoring. Over time, these clusters will naturally expand into nearby areas. Understory planting will include species such as snowberry, osoberry, Douglas' spiraea, pacific ninebark, nootka rose, serviceberry, and sword fern, and sedges. Shrubs may be planted from containers, bare root, or by seed.
- Action: [ongoing] Prevent non-native invasive tree and shrub species from establishing within the riparian restoration areas. Target species for eradication include English hawthorn, cherry, Armenian blackberry, and Scot's broom.
- Action: [ongoing] Control weed species that have high potential for rapid spread in the riparian restoration areas. Target species for control include tansy ragwort, thistle (multiple species), spotted knapweed, common mullein, reed canarygrass, false brome, jimson weed, and shining geranium. This list may increase over time based on emerging threats. Methods for weed control may include herbicide application, shade cloth, hand pulling, or mowing.
- Action: [on-going] Prevent animal damage on vegetation during early years of establishment through the use of browse protection guards, fencing, and organic repellents.

Photo by Jeff Krueger

Trees planted in 2007 on former agricultual land on the north end of Green Island

Objective 3b. Establish native riparian and wetland vegetation on the network of swales that runs through the agricultural lands on Green Island, totaling approximately 70 acres. [Refer to areas coded R3 & R4 on Desired Future Habitat Conditions and Management Actions Map]

- Actions: Same as actions listed under Objective 3a (riparian forest), but will utilize plant species better suited for the wetter conditions and seasonal inundation found in the swales. In addition, wetter swales coded R4 will be seeded with a mixture of moisture tolerant species such as rushes, sedges, tufted hairgrass, and spiraea.

Objective 3c. Establish native wetland and riparian vegetation communities on and around the CARP area in association with planned re-contouring of the ponds and disturbed areas.

- Actions: Similar to actions listed under Objective 3a (riparian forest).

Objective 3d. Establish upland prairie on the agricultural lands of Green Island in selected areas, totaling approximately 80 acres. Prairie will benefit the overall habitat conditions of Green Island by providing diversity within the surrounding riparian forests and produce edge habitat conditions preferred by many wildlife species. Prairie will be established in three main patches: one just to the north of Crescent Lake (Confluence Prairie), one just to the south of the nexus (Nexus Prairie), and one adjacent to the entry road just to the east of the low water crossing. In addition, native prairie will be established under all power lines on the site, where trees and shrubs are not permitted due to access requirements.

- Action: Increase species diversity in Confluence Prairie over time. This 45 acre area was initially planted with a low diversity grass mix in 2010 to establish native cover. To add diversity, this area will be over-seeded with a diverse native grass and forb mix following an ecological burn or haying of the area. Seed will be broadcast in the late fall and the ground will be harrowed to achieve better seed-soil contact. [Refer to areas coded P1 on Desired Future Habitat Conditions and Management Actions Map]
- Action: Establish native prairie under all power lines, totaling approximately 15 acres. Initially, an aggressive native seed mix will be utilized in these areas to establish cover. Over time, additional native grasses and forbs will be introduced as feasible. [Refer to areas coded P2 on Desired Future Habitat Conditions and Management Actions Map]
- Action: Establish a high diversity native prairie patch on approximately 19 acres just to the south of the nexus (Nexus Prairie) and along the entry road. Over time, Nexus Prairie could serve as a seed source for prairie enhancement projects on Green Island and possibly other nearby MRT sites. [Refer to areas coded P3 on Desired Future Habitat Conditions and Management Actions Map]
- Action: Limit tree and shrub establishment within all established prairie areas. Trees and shrubs should not be allowed to exceed more than 10% of the total cover. Woody vegetation control will be achieved through a combination of annual or semi-annual rough-mowing or haying (late summer or fall) and burning on a 3-5 year rotation if feasible (burning is generally not permitted directly under electric lines).
- Action: Prevent non-native invasive tree and shrub species from establishing in the prairies. Target species for eradication include English hawthorn, cherry, Armenian blackberry, and Scot's broom.
- Action: Control invasive weed species that have high potential for rapid spread in the prairies. Target species for control include reed canarygrass, tansy ragwort, thistle, hairy cat's ear (*Hypochaeris radicata*), spotted knapweed, and creeping bentgrass. Methods for weed control may include herbicide application, shade cloth, or mowing.

One of the designated savanna areas (S1) on the north end of Green Island

Photo by Chris Vogel

Objective 3e. Establish approximately 29 acres of savanna habitat on the agricultural lands of Green Island. Savanna will be

established in five patches on the northern half of Green Island. These patches have been sited based on soil conditions, existing tree cover, or proximity to prairie habitats. Savanna will benefit the overall habitat conditions of Green Island by providing diversity within the surrounding riparian forests and produce edge habitat conditions preferred by many wildlife species.

- Action: Establish a savanna understory of aggressive native grasses such as blue wildrye, California oatgrass, Roemer's fescue, California fescue, and California brome and introduce additional grass and forb species over time to provide diversity.
- Action: Plant native savanna tree species at an approximate density of between 5 and 35 trees per acre (5-50% cover). Tree species will primarily be Oregon white oak and ponderosa pine, but will also include some additional species such as bigleaf maple, black cottonwood, and incense cedar.
- Action: Prevent non-native trees and shrubs from establishing within the savanna. Target species for eradication include English hawthorn, cherry, Armenian blackberry, and Scot's broom.
- Action: Control invasive weed species that have high potential for rapid spread in the savanna understory. Target species for control include tansy ragwort, thistle, hairy cat's ear, spotted knapweed, creeping bentgrass, and false brome. Methods for weed control may include herbicide application, shade cloth, or mowing.

Goal 4: Native Wildlife Habitat
Protect and enhance habitat conditions for native wildlife species.

Objective 4a. Protect, enhance, and restore a mosaic of native plant communities across the site upon which native wildlife species depend.

- Actions: Implement habitat protection and enhancement actions described under goals 1, 2, and 3, including establishment and enhancement of riparian forest, savanna, and prairie and restoration of natural hydrologic processes.

Ruby crowned kinglet perched on a bigleaf maple limb

Photo by Tim Giraudier

Objective 4b. Install habitat features, enhance vegetation, and modify site features to improve conditions for native wildlife.

- Action: Place large wood and root wads in river side channels and ponds to provide cover for native fish including Oregon chub, Upper Willamette spring Chinook, and bull trout and basking areas for reptiles such as the Western pond turtle.
- Action: Place logs and rock piles and leave downed trees and limbs to provide reptile habitat. Placement of features will consider maintenance access needs.
- Action: Install culverts at the nexus and the low water crossing to facilitate improved side channel flows and allow fish passage.
- Action: Remove approximately 9,500 lineal feet of unnecessary road segments from the site over time to limit potential impacts to wildlife such as ground nesting birds and turtles and reduce potential human trespass (see Action Plan Map for segments proposed for removal).

Photo by Chris Vogel

Large woody debris placement along Crescent Lake (2008)

- Action: Manage areas adjacent to known Western pond turtle populations to protect and enhance nesting conditions. This may include invasive species control, maintaining suitable native vegetation (sparse low growing grasses and forbs), and possible importation of sandy loam soils.
- Action: Introduce nectar producing forb species into prairie and savanna areas over time to support native pollinators and butterfly species. Target species for introduction will include wooly sunflower (*Eriophyllum lanatum*), cat's ear (*Calochortus tolmiei*), great camas (*Camassia leichtlinii* var. *suksdorfii*), Rosy checkermallow (*Sidalcea virgata*), Hooker's onion (*Allium acuminatum*), and Kincaid's lupine (*Lupinus sulphureus kincaidii*).
- Action: Improve habitat conditions for native bird species by installing nesting boxes for species such as Barn Owl, Wood Duck, Western Screech Owl, and Western Bluebird; nesting platforms for Osprey and Bald Eagle; and perches for raptors such as American Kestrel and Northern Harrier.

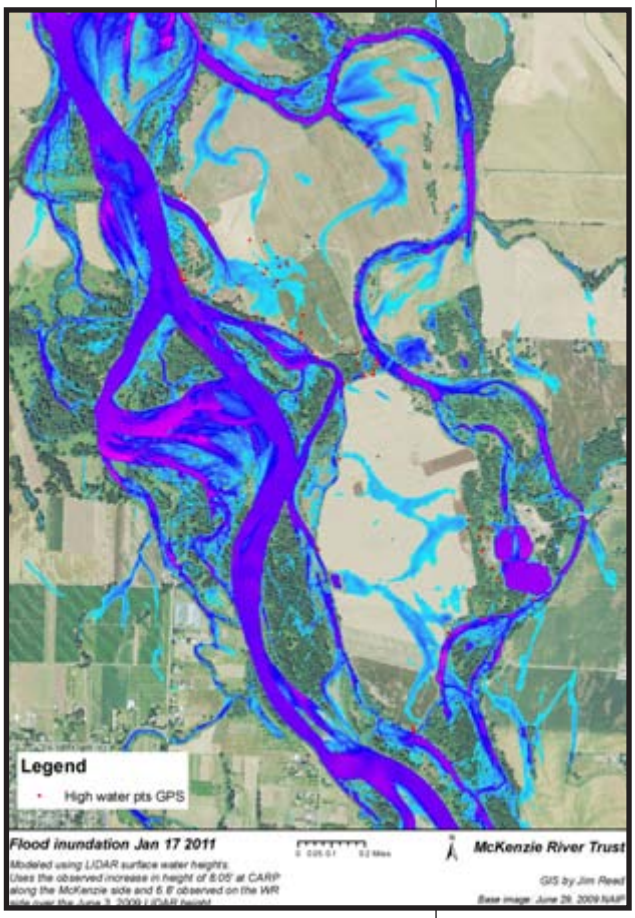
Objective 4c. Reduce non-native wildlife species that predate or compete with native species and consider limited control of some common native wildlife species on a temporary basis to help improve establishment of native vegetation.

- Action: Reduce non-native fish populations through implementation of habitat improvements such as re-contouring and reconnecting former aggregate ponds and promoting better side channel flows and connectivity.
- Action: Trap and remove the feral cats known to inhabit Green Island, limiting their prey on native wildlife such as ground nesting birds.
- Action: Monitor for the presence of non-native wildlife such as turkeys, nutria, feral cats and bull frogs. Use the adaptive management approach to assess threats and determine actions.
- Action: Consider measures to temporarily reduce black-tailed deer and gray-tailed vole populations as a way to help increase plant survival rates.

5.5 Monitoring and Mapping

Goal 5: Monitoring and Mapping
Provide adequate baseline and post project data on site vegetation, wildlife, and hydrology to inform management decision and track change over time.

Photo by Jim Reed



Flood Inundation Map produced to document the January 2011 flood event

Objective 5a. Develop and implement a cost effective monitoring program to document changes to the Green Island's vegetation communities, wildlife, and hydrology over time.

- Action: Develop a set of vegetation and wildlife monitoring goals and protocols for the overall site that are both cost effective and effective for gauging change over time.
- Action: Develop specific vegetation and wildlife monitoring goals for individual restoration and enhancement projects prior to implementation. The monitoring approach should be cost effective, while providing adequate information to allow managers to gauge project success.
- Action: Collect baseline data in areas proposed for enhancements prior to implementation of major projects as feasible. This could include assessment of pre-project vegetation, recording hydrology, and establishment of photo points.
- Action: Conduct adequate post-project monitoring to gauge success and inform the adaptive management process as feasible.

Objective 5b. Provide baseline vegetation data on rare plant populations, patches of high quality vegetation, and invasive species present on Green Island.

- Action: Record locations of rare or unique plant populations and other plant species of interest using GPS as feasible (initial surveys were conducted in 2005 by Salix Associates).
- Action: Record and map populations of highly invasive species that have potential to rapidly spread across the site. This will include concentrations of species such as false brome, knot weed, traveler's joy, and butterfly bush, jimson weed, and other newly emerging threats.
- Action: Map large concentrations of more widespread invasive species such as Armenian blackberry and Scot's broom as feasible.

Objective 5c. Conduct fish and wildlife surveys on the site, focusing on listed species and species at risk.

- Action: Develop an overall fish and wildlife monitoring plan for Green Island, including determining which species are to be monitored, frequency and types of surveys needed, data analysis procedures, etc. This will build on existing fish, reptile and amphibian, and breeding bird surveys that have been conducted in recent years.
- Action: Conduct cost effective fish and wildlife surveys in the years subsequent to major enhancement efforts at Green Island, using similar

Monitoring
See Appendix B: *Green Island Monitoring Map* for locations of monitoring points for hydrology, avian counts, and vegetation.

methodology to the baseline surveys so that the impacts on wildlife populations can be gauged over time.

- Action: Determine abundance and locations of native fish populations, with a concentration on key species including Oregon chub, Upper Willamette spring Chinook, bull trout, cutthroat trout, and Pacific lamprey.
- Action: Determine nesting and breeding locations of Western pond turtles and red-legged frogs.

Photo by Chris Vogel

A non-native largemouth bass collected during fish monitoring at Green Island

Objective 5d. Provide baseline data on site hydrology, channel migration, and water quality to inform management decisions and track change over time.

- Action: Record the extent flood inundation during major events is recorded using GPS mapping, staff gauges, and photography. [underway]
- Action: Continue to update the existing 2-dimensional hydraulic model for Green Island to reflect changes in on-the-ground conditions such as levee removal and river migration as feasible and to help evaluate potential CARP area restoration options.
- Action: Record major erosion and deposition on and around Green Island on a yearly basis. [underway]
- Action: Continue water quality monitoring program, with emphasis on monitoring of backwater sloughs for temperature and nitrate. [underway with EPA]

5.6 Education, Research, and Public Use

Goal 6: Public Use

Provide opportunities for the public to access Green Island for tours on a limited and controlled basis over the short-term and consider options for expanding public access over the long-term. The site provides some unique opportunities for activities such as nature study, passive recreation, education, and special events.

Objective 6a. Provide opportunities for individuals and groups to tour Green Island on a controlled basis over the short-term (3-5 years).

- Action: Offer guided tours of Green Island on a regular basis to interest groups and the general public as demand dictates (ongoing, but limited).
- Action: Train volunteers or docents to lead tours of Green Island as a way of reducing requirements of MRT staff time. This will require development of background materials and a list of key themes or topics to include in the training.
- Action: Provide basic facilities such as restroom and parking to accommodate visitors (existing facilities are sufficient for current use).
- Action: Install a boot cleaning station near parking areas to help limit spread of invasive species to and from the site.

- Action: Limit vehicular access to the main body of the site to the extent practical to help prevent spread of invasive species, reduce wildfire risk, and limit wildlife impacts. Vehicle access should be limited to the designated parking areas when ever possible.

Objective 6b. Develop a long-term strategy for accommodating expanded public use at Green Island that is compatible with the conservation values for the site and consistent with MRT organizational goals (5-20 years). Expanded public access will not be possible until agricultural uses are fully phased out and major restoration projects are completed to avoid public safety issues.

- Action: Consider a range options for possible long-term expansion of public access on Green Island within the broader context of the MRT mission. Any expanded public access and use must be consistent with the guidance included in the Green Island conservation easements and associated conservation values. A range of options for consideration include the following:

Table 5-1: Options for Long-Term Public Access

Options	Description
A. Limited Public Access	MRT would permit general public access (by foot only) on designated days only. This would require some staff or volunteer time to monitor actives and open/close gates. Areas of access would need to be defined to limit public access to sensitive areas and minimal facilities such as directional signage, restrooms, and trails would need to be provided.
B. General Public Access	MRT could permit general public access (by foot only) on a regular basis during daylight hours. This would require significant staff time to monitor activities and construction of adequate facilities such as expanded rest rooms, installation of way-finding signage, addition of gates and boundary signage, and information kiosk(s) for posting maps, restrictions, and rules.
C. Allow Limited Special Events	MRT could provide some limited/general public access (Options A and B), plus allow access to the property for special events such as limited duration gatherings, conservation related fund-raisers, and natural resource management training.
D. Partnership with Non-Profit to Oversee Public Use	MRT could partner with, or help form, a non-profit organization responsible for managing public access on Green Island and to conduct fund raising for facilities and staffing. This could be modeled after other local non-profits such as Friends of Buford Park and Mount Pisgah and the Willamette Resources Education Network (WREN).
E. Partner with Public Agency to Oversee Public Use	MRT could establish an agreement with a public agency such as the Oregon Parks and Recreation Department or USFWS to provide staffing and facilities for public access at Green Island.
F. Contract for Services	MRT could contract with a concessionaire to oversee public use at Green Island. The concessionaire would provide access and facilities at a level defined by MRT.
G. Transfer of Ownership	MRT could eventually transfer ownership to an agency or organization with adequate funding and expertise to accommodate formal public access, construct facilities, and provide staffing. Oregon Parks and Recreation Department and USFWS would be potential options for this approach.

Guidelines for public access under all scenarios listed above:

- Public access would be by foot only, with designated parking located near the entry to the site. Exceptions could be granted for hauling materials for work parties or special event set-up or educational purposes.
- Only passive recreational activities such as hiking, nature study, bird watching, photography, picnicking, educational field trips, non-motorized boating, and limited duration events would be permitted.
- Public access would be limited to designated areas only. This would include designated trails, roads, and view points with possible seasonal closures of areas to limit impacts to wildlife.
- Dogs and other pets will not be permitted to limit impacts to native wildlife.
- Public access will be controlled to limits impacts to the site's conservation values and must be consistent with the prohibited/permitted activities listed in the site's conservation easement.

Objective 6c. Provide additional facilities as needed to support future public access and use.

- Action: Consider adding a designated gravel parking area along the main entry road near the eastern edge of the site (see Action Plan Map). This area would be fenced to contain the parking and would accommodate between 10 and 15 vehicles.
- Action: Consider installing an information kiosk and/or signage along the entry road on the eastern edge of the site. This would provide basic site information, access regulations, and contact information.
- Action: Consider officially designating a primitive campsite for Willamette Water Trail users on one of the Willamette River Islands in MRT ownership. Camping, which is already an established use on several islands, could be consolidated to a designated spot or spots and limited to small parties to help minimize potential habitat impacts. Becoming an active partner in the Water Trail could also create opportunities for shared management of camp sites, thus reducing MRT staff requirements.

Goal 7: Outreach and Education

Utilize Green Island for environmental education to enhance public appreciation, understanding, and enjoyment of fish, wildlife, habitats and cultural resources. The site provides some unique educational opportunities on topics such as floodplain restoration, native habitats, wildlife, and local history.

Objective 7a. Provide educational opportunities for conservation groups such as Lane County Audubon Society and the Native Plant Society of Oregon to access the site for field visits and information gathering. These partnerships should be utilized to help MRT achieve its monitoring objectives where possible.

- Action: Consistent with restoration activities and maintaining the conservation values of the site, provide reasonable access to conservation organizations that will broaden the understanding and appreciation of natural habitats, restoration work, and natural processes.
- Action: Encourage conservation groups to maintain records and inventories of site and coordinate so data can help MRT achieve its monitoring objectives.

Photo by Chris Vogel

Bird watchers at Green Island

Objective 7b. Conduct outreach aimed at informing the interested public of ongoing activities at Green Island.

Abandoned ferry viewed from the west side of historic McKenzie River crossing

Photo by Jeff Krueger

- Action: Provide opportunities for communication to nearby communities, adjacent property owners, and the interested public regarding site activities through regular press releases, newsletter articles, web postings, and personal contact.
- Action: Provide opportunities for information sharing and exchange with other restoration practitioners and researchers including site tours of Green Island.

Objective 7c. Document site history and preserve unique historic features.

- Action: Continue to collect information related to the Green Island's history including historic photographs, maps, and oral histories to help document the cultural significance of the site and inform future restoration and management actions.
- Action: Retain the ferry in its current location to serve as a reminder of the site's human history and the dynamic nature of the river. Remove hazardous elements such as cables and anchors as necessary. Explore potential for creating a visual access point to the ferry from the west side of the channel as a way to help limit direct visitor access onto the aging ferry itself.

Goal 8: Research

Make Green Island available to qualified organizations and partners for research activities that are consistent with the site's conservation values.

Objective 8a. Provide research opportunities for natural resource agencies, educational institutions, and their students, particularly activities that assist with monitoring, restoration and adaptive management of the site (see monitoring needs listed under goal 5).

- Action: Maintain communication and seek research opportunities with professors and students at the University of Oregon, Oregon State University, and other regional colleges who are conducting research relevant to the natural processes, wildlife, and fish populations of Green Island.
- Action: Work with local non-profit organizations such as the Native Plan Society of Oregon – Emerald Chapter, Lane County Audubon Society, and the North American Butterfly Association to conduct research and inventories that will assist MRT with the monitoring and management of the site.
- Action: Encourage research-oriented relationships by providing reasonable access to project resources, such as GIS data layers, field tours, and management activities.
- Action: Seek funding partnerships that would assist relevant research opportunities.
- Action: Continue to support ongoing research efforts being conducted on Green Island including Coldwater Refugia (OSU), Hydrology and Nutrient Dynamics (USEPA), and Effects of US Army Corps of Engineers Willamette Projects Operations on Oregon Chub and Other Floodplain Fishes (ODFW).
- Action: Consider working in partnership with HJ Andrews Experimental Forest, OSU Spring Creek Project, or other similar research oriented project to incorporate Green Island into a Long Term Ecological Research Station framework for large scale floodplain study.
-

5.7 Operations and Maintenance

Goal 9: Access and Maintenance
Provide adequate access and facilities to support planned habitat restoration and management activities and ongoing maintenance on Green Island.

Objective 9a. Provide adequate access to the site for restoration projects, ongoing management activities, research, and tours.

- Action: Maintain all-season access along the main gravel access road and the designated road spurs that access the northern and southern portions of Green Island (see *Action Plan Map* for locations).
- Action: Retain two-track travel lanes in designated areas to provide dry season access for management activities and access to research areas. Designated travel lanes will help consolidate vehicular access and limit potential natural resource impacts. (see *Action Plan Map* for locations).
- Action: Maintain the low water crossing by removing blockages such as wood and gravel and repairing any damage cause by large flood events.
- Action: Maintain walking trails in designated areas to provide access for tours and research projects (see Action Plan Map for locations). Trails will be maintained primarily through mowing.

Objective 9b. Limit illegal trespass onto the site (intentional and non-intentional).

- Action: Keep main entry gate locked except during major events or restoration activities and limit distribution of lock combination.
- Action: Coordinate with Lane County to limit illegal access to the MRT property on the west side of the river and retain the existing gate located in Hileman Park.
- Action: Install locking gates in two locations along the southeastern edge of the site where illegal access is occurring (see *Action Plan Map*).
- Action: Install signage where necessary to clarify site boundaries and access restrictions.
- Action: Monitor illegal trespass and vandalism and take appropriate actions.

Photo by Jeff Krueger

Road parallel to the Willamette River on south side of Green Island

Objective 9c. Provide facilities to support restoration and management activities, research, and public tours and events.

- Action: Maintain existing wells, pumps, and irrigation lines to allow for irrigation of restoration projects and fire suppression as needed.
- Action: Maintain existing outbuildings in their current location and utilize this area for equipment storage, staging, and as a covered area for events.

BPA electrical transmission lines

- Action: Provide restroom facilities on site adequate to accommodate visitors, contractors, volunteers, and events. This will likely be continued use of a portable restroom for the short-term.
- Action: Maintain passable trail access to the EPA research wells until this research is complete. The trail could also be used to accommodate tours onto Gallery Island.

Objective 9d. Manage vegetation to prevent conflict with utilities and prevent wildfire.

- Action: Maintain the areas under the BPA and EPUD power lines to limit growth of woody vegetation and allow utility maintenance access as needed. This will be achieved through seasonal mowing or haying, timed to avoid conflict with ground nesting birds.
- Action: Mow travel lanes as needed during fire season to prevent vehicle caused wildfire.

Objective 9e. Work to improve the visual quality along the main access road as it enters the site in the area just to the east of the low water crossing to create an attractive gateway for visitors.

- Action: Re-contour and smooth the disturbed areas along the entry road to remove invasive vegetation and place soil on top of the scraped and compacted areas to help promote re-vegetation.
- Action: Implement the proposed riparian and prairie restoration in the areas along the main entry road to the east of the low water crossing. Plantings in this area could include a diversity of showy native shrubs and forbs selected to maximize visual quality.
- Action: Place entry signage along the main access road at the east property boundary to welcome

The main entrance road to the east of the low water crossing

Green Island Management Plan

Action Plan Map

DRAFT
May 2011

0 500 1,000 feet
Scale

One Acre

N
W E
S

Aerial Photo: Summer 2009

Map produced by LCOG

Proposed Actions

- Remove Levee/Flood Berm
- Retain Levee/Flood Berm
- Abandon or Remove Revetment
- Remove Travel Lanes and Roads
- Retain/Maintain as All-Season Road (graveled)
- Retain as Two-Track Travel Lane (seasonal)
- Maintain Walking Trails (mow/weed-wack)
- Remove Fill to Re-Connect Swales to Floodplain
- Install Gate
- Install Fish Friendly Culvert or Bridge (to be designed)
- Large Wood Placement Area (logs/root wads)
- Gravel Parking Area (approximately 10 cars and signage)

Legend

- Green Island Site Boundary
- Electric Lines (EPUD and BPA)
- EPUD Poles
- Wells (irrigation)
- EPA Research Wells
- Levee/Berm Removed (2007/10)
- Existing Gates
- Key Vista Point
- Designated Parking Area
- Revetments (off site)
- Large Wood Placement (2008/10)

Old McKenzie Confluence View Point
Remove Berm
Confluence Pool
Riprap Pool
Pylons
BPA Transmission Lines and Right of Way
Willamette
Crescent Lake
Levee Removed (2007)
Temporary Staging Area
Smooth and Plant Berms
Designate Parking for ~10 vehicles and fence perimeter
Levee Removed (2010)
Install Bridge or Culverts
Green Island Road (MRT ownership/easement)
Possible Designated Water Trail Camp Site
Oxbow Island
Abandon or Remove Revetment
Side Channel Island
Nexus
Ferry Pool
Historic Ferry Crossing
Retain Outbuildings and Staging Area
Chub Pool
Remove Roads
Multiple Culverts (off site)
New Gate
CARP
New Gate
County Gate
Re-contour Pond
River
Gallery Island
Abandon or Remove Revetment
Remove Roads
Remove Road
Re-contour Ponds, Reconnect Side Channels, and Restore Riparian Vegetation
Orchard Pool
Confluence View
Patio Pool
Remove Levee/Berm (~6,000 lf)
McKenzie River

DRAFT
May
2011

0 500 1,000 feet
Scale

N
W E
S

One Acre

Aerial Photo:
Summer 2009

Map produced by LCOG

Green Island Management Plan

Desired Future Habitat Conditions and Management Actions

Riparian
- R1 Maintain and Enhance Established Riparian Areas
- R2 Establish Riparian Forest on Ag. Terraces and Disturbed Areas

Riparian Swales
- R3 Establish Riparian Forest in Seasonal Swales
- R4 Establish Riparian Shrub/Sedge Community in Wetter Swales

Prairie
- P1 Maintain Restored Prairie and Add Diversity Over Time
- P2 Establish Prairie Under Power Lines (aggressive native grasses)
- P3 Establish High Diversity Prairie

Savanna (oak-pine dominant)
- S1 Establish Savanna with Grass/Forb Understory

Coniferous Forest
- C1 Maintain and Enhance Coniferous Forest and Add Understory

Open Water (maintain and enhance perennial ponds and pools)

River Side Channels (allow natural river migration to continue)

Legend

- Green Island Site Boundary
- Electric Lines (EPUD and BPA)
- Proposed Box Culverts
- Proposed All-Season Roads
- Proposed Two-Track Travel Lanes

Add diversity to the established prairie over time

Establish prairie under power lines (aggressive native grasses/forbs)

Establish high diversity native prairie and use area for seed collection

Re-contour pond and reconnect to floodplain

Focus weed management efforts on Gallery Island

Re-contour ponds, reconnect side channels, and restore riparian vegetation

Re-establish side channel flow during CARP area restoration (remove berm)

Confluence Pool
Riprap Pool
Powerline Pool
Confluence Prairie
Crescent Lake
Willamette River
Pylons
BPA Transmission Lines
Green Island Road
(MRT ownership/easement)
Ferry Pool
Nexus
Nexus Prairie
Chub Pool
CARP
Orchard Pool
Gallery Island
Patio Pool
McKenzie-Willamette Confluence
McKenzie River

6.0 Implementation Priorities

The table below prioritizes proposed management actions based on the need for immediate action versus actions which can occur in the longer-term. The prioritization is intended to indicate preferred implementation sequencing. However, the order in which the recommended actions are implemented is based largely on the type of funding sources that can be obtained, partnership opportunities, and possible use of volunteers.

The following categories have been selected to indicate overall priorities:

I	Short Range (highest priority): Will be undertaken as soon as possible (ASAP).
II	Medium Range: Less pressing, but will be implemented when funding is available.
III	Long Range: Will be implemented over a longer period of time due to the complexity or cost of the task or is dependant on other actions being completed first.
RM	Regular Maintenance or Management Activity: Performed on an annual of bi-annual basis.
NP	Natural Processes: Allow natural process such as river migration to occur.
O	Ongoing: Continue activity on a regular basis until complete

Note: The goals, objectives, and actions listed below have been shortened for this table (refer to the Section 5 for the full narrative).

Table 6-1: Implementation Priorities

Management Goals and Objectives*	Priority	Notes
Goal 1: Hydrology Enhance natural hydrologic processes on GI including flooding, channel migration, groundwater interaction, and formation of backwater areas to the extent practical.		
Objective 1a. Eliminate barriers that currently limit natural floodplain interaction and inundation on Green Island.		
Action: Remove the existing flood control levee/berm located along the southern edge of Green Island	I	Potentially utilize material in CARP pond restoration project
Action: Remove the road fill from the swales on the southern half of Green Island	II	
Action: Re-contour the small gravel pit pond near Gallery Island	II-III	In conjunction with road removal
Action: Install a fish passable structure under levee at the nexus	I	
Action: Remove fill material at west end of the nexus channel	I	
Action: Improve the current "low water crossing"	I	Will reduce annual maintenance
Action: Remove the berms around the CARP ponds	II-III	In conjunction with CARP restoration
Objective 1b. Allow natural channel migration to occur on and around Green Island.		
Action: Allow the degradation of the revetments located along the Willamette River on the western edge of Green Island to continue	NP	
Action: Work with adjacent public and private land owners to limit installation and repair of armored banks	O	
Action: Reconnect the historic McKenzie River channel that flowed through the CARP	II-III	In conjunction with CARP restoration
Action: Assess side channel areas and remove blockages	III	Conduct on experimental basis
Objective 1c. Continue to study the complex relationship between sub-surface hyporheic flows and surface water		
Action: Assess and utilize results from ongoing groundwater studies	O, III	Pending completion of studies
Action: Continue to allow Green Island to be utilized for research	O	
Action: Complete the inundation duration analysis	II	
Objective 1d. Support the Sustainable Rivers Project		
Action: Coordinate with partners including the Corps and TNC	O	
Goal 2: Established Native Vegetation Communities Protect and enhance established native plant communities.		
Objective 2a. Protect and enhance the established riparian plant communities where they currently exist (~280 acres).		
Action: Control the most aggressive invasive weed species	O	Currently underway
Action: Ensure that no new highly invasive weed species establishing	O,I	Dependent on weed monitoring
Action: Establish native trees, shrubs, and grasses where cover is lacking.	O, II	Ongoing: Immediately following projects Priority II: Adjacent to channels
Objective 2b. Preserve and enhance the existing patch of coniferous forest.		
Action: Thin the existing Douglas-fir stand	II	Initial thinning occurred in 2010
Action: Establish a native understory	III	After thinning fully complete
Action: Diversify forest stand by introducing additional tree species	III	After thinning fully complete

Management Goals and Objectives*	Priority	Notes
Objective 2c. Preserve and enhance river side channels and their associated native aquatic and riparian vegetation.		
Action: Establish native trees and shrubs	I	Where lacking along channels
Action: Ensure no new invasive aquatic plant species establishing	RM	Weed monitoring is key
Action: Attempt to control established highly invasive aquatic vegetation	II-III	Aquatic vegetation control methods are not well established
Action: Identify and preserve exiting populations of native floating, submersed, and emergent plant species	II	Partner with local non-profit to achieve this specialized monitoring if possible
Goal 3: Re-Establish Native Vegetation Re-establish a diversity of native vegetation communities on agricultural lands and other disturbed areas.		
Objective 3a. Establish riparian forest on agricultural lands and other disturbed areas of GI (~450 acres).		
Action: Establish a dense native grass cover crop	I	Implement as soon as agriculture is phased out
Action: Plant a diversity of native riparian tree species	I	Underway, Tree planting years 1-5
Action: Introduce a variety of native riparian understory species	III	Years 5-15
Action: Prevent non-native invasive tree/shrub establishment	RM	Currently underway
Action: Control weed species that have high potential for rapid spread	I	Currently underway
Action: Prevent animal damage during early years of establishment	I	Currently underway
Objective 3b. Establish native riparian and wetland vegetation on the network of swales.		
Actions: Same as actions listed under Objective 3a	Same	
Objective 3c. Establish native wetland and riparian vegetation communities on and around the CARP area.		
Actions: Similar to actions listed under Objective 3a	II-III	In conjunction with CARP restoration
Objective 3d. Establish upland prairie totaling approximately 80 acres.		
Actions: Increase species diversity in Confluence Prairie over time	I, III	Priority I: Weed control Priority III: Diversify
Actions: Establish native prairie under all power lines	I	Plant as soon as phase out of agriculture
Actions: Establish a high diversity native prairie (Nexus Prairie) & entry	II-III	Secure full imp. funding before starting
Actions: Limit tree and shrub establishment	RM	Mow/burn/hay as feasible
Actions: Prevent non-native invasive tree and shrub establishment	RM	
Actions: Control invasive species w/high potential for rapid spread	I, RM	Priority I: Confluence Prairie
Objective 3e. Establish approximately 29 acres of savanna habitat on the agricultural lands		
Action: Establish an understory of aggressive native grasses	I	
Action: Plant native savanna tree species	II	Years 1-5
Action: Prevent non-native trees/shrubs from establishing	RM	
Action: Control invasive species w/high potential for rapid spread	RM	
Goal 4: Native Wildlife Habitat Protect and enhance habitat conditions for native wildlife species.		
Objective 4a. Protect, enhance, and restore a mosaic of native plant communities across the site		
Actions: Implement habitat protection and enhancement actions described under goals 1, 2, and 3	Same as goals 1-3	
Objective 4b. Install habitat features, enhance vegetation, and modify site features to improve conditions for native wildlife.		
Action: Place LWD in river side channels and ponds	I-II	As material becomes available
Action: Place logs/rock piles/downed trees for reptile habitat	II-III	Volunteer opportunity
Action: Remove approximately 9,500 lineal feet of unnecessary road	I-III	Remove as roads no longer needed
Action: Manage areas adjacent to Western pond turtle populations	I-II	
Action: Introduce nectar producing forb species in prairie/savanna	II-III	
Action: Improve nesting and roosting conditions for native bird species	I-III	Volunteer opportunity (Bird boxes)
Objective 4c. Reduce non-native wildlife species that predate or compete with native species		
Action: Reduce non-native fish populations through implementation of habitat improvements	O	In conjunction with CARP restoration and other proposed actions
Action: Trap and remove the feral cats	II	
Action: Monitor for non-native wildlife and determine actions	O	Adaptive management
Action: Consider measures to temporarily reduce deer and vole populations as a way to help increase plant survival rates.	I-II	In conjunction with first few years of tree establishment
Goal 5: Monitoring and Mapping Provide adequate baseline and post project data to inform management decision and track change over time.		
Objective 5a. Develop and implement a cost effective monitoring program.		
Action: Develop vegetation and wildlife monitoring goals and protocols	I	
Action: Develop specific vegetation and wildlife monitoring goals for individual restoration and enhancement projects	O	Prior to implementation of restoration and enhancement activities
Action: Collect baseline data in areas proposed for enhancements prior to implementation of major projects	O	

Management Goals and Objectives*	Priority	Notes
Action: Conduct adequate post-project monitoring to gauge success	O	
Objective 5b. Provide baseline vegetation data on rare plant populations, patches of high quality vegetation, and invasive species		
Action: Record locations of rare or unique plant populations	II	
Action: Record and map populations of highly invasive species that have potential to rapidly spread across the site.	I, O	Annual weed mapping
Action: Map large concentrations of more widespread invasive species such as Armenian blackberry and Scot's broom as feasible.	III, O	
Objective 5c. Conduct fish and wildlife surveys on the site.		
Action: Develop an overall fish and wildlife monitoring plan	I	
Action: Conduct cost effective fish and wildlife surveys in the years subsequent to major enhancement efforts	II	
Action: Determine abundance and locations of native fish populations	II	
Action: Determine nesting and breeding locations of Western pond turtles and red-legged frogs.	II	Potential volunteer project
Objective 5d. Provide baseline data on site hydrology, channel migration, and water quality to track change over time.		
Action: Record the extent flood inundation.	O	During significant flood events
Action: Continue to update the existing 2-dimensional hydraulic model	II	
Action: Record major erosion and deposition	O	Following significant flood events
Action: Continue water quality monitoring program (EPA Study)	O	Support continuation of this research
Goal 6: Public Use Provide opportunities for the public to access GI for tours on a limited and controlled basis over the short-term and consider options for expanding public access over the long-term.		
Objective 6a. Provide opportunities for individuals and groups to tour GI on a controlled basis over the short-term (3-5 years).		
Action: Offer guided tours of Green Island on a regular basis	O	
Action: Train volunteers or docents to lead tours of Green Island	I	Will limit MRT staffing needs for tours
Action: Provide basic facilities such as restroom and parking	RM	Adequate facilities exist for short-term
Action: Install a boot cleaning station near parking areas	I	
Action: Limit vehicular access to the main body of the site as practical	I-III	Following restoration and ag. phase-out
Objective 6b. Develop a long-term strategy for accommodating expanded public use at Green Island that is compatible with the conservation values for the site and consistent with MRT organizational goals (5-20 years).		
Action: Consider a range options for possible long-term expansion of public access on Green Island	II-III	
Objective 6c. Provide additional facilities as needed to support future public access and use.		
Action: Consider adding a designated gravel parking area along the main entry road near the eastern edge of the site	II	Coordinate with road removal/restoration projects in that area
Action: Consider installing an information kiosk and/or signage	III	Following phase out of agricultural lease
Action: Consider officially designating a primitive campsite for Willamette Water Trail users	II, RM	RM: once established
Goal 7: Outreach and Education Utilize GI for environmental ed. to enhance public appreciation, understanding, and enjoyment of habitats and cultural resources.		
Objective 7a. Provide educational opportunities for conservation groups such as Lane County Audubon Society and the Native Plant Society of Oregon to access the site for field visits and information gathering.		
Action: Provide reasonable access to conservation organizations	O	
Action: Encourage conservation groups to maintain records and inventories	I, O	Utilize to help achieve monitoring objectives where possible.
Objective 7b. Conduct outreach aimed at informing the interested public of ongoing activities at Green Island.		
Action: Provide opportunities for communication to nearby communities, adjacent property owners, and the interested public	O	
Action: Provide opportunities for information sharing (partners)	O	Currently underway
Action: Continue to collect information related to the GI's history	I, O	Priority I: Document Green family history
Action: Retain the ferry in its current location	II, O	Priority II: Remove cables
Goal 8: Research Make GI available to qualified organizations and partners for research activities that are consistent with the site's conservation values.		
Objective 8a. Provide research opportunities for natural resource agencies, educational institutions, and their students, particularly activities that assist with monitoring, restoration and adaptive management of the site (see monitoring needs listed under goal 5).		
Action: Maintain communication and seek research opportunities	O	Currently underway
Action: Encourage research-oriented relationships	O	Currently underway
Action: Seek partnerships that would assist relevant research opportunities	I	Currently underway
Action: Continue to support ongoing research efforts	O	
Action: Consider working in partnership with HJ Andrews Experimental Forest, OSU	O	Discussions underway

Management Goals and Objectives*	Priority	Notes
Spring Creek Project, or other similar research oriented project.		
Goal 9: Access and Maintenance Provide adequate access and facilities to support planned habitat restoration , management, and maintenance on GI.		
Objective 9a. Provide adequate access to the site for restoration projects, ongoing management activities, research, and tours.		
Action: Maintain all-season access along the main gravel access road s	RM	Currently underway
Action: Retain two-track travel lanes in designated areas	RM	Seasonal access
Action: Maintain the low water crossing by removing blockages such as wood and gravel and repairing any flood damage.	RM	Will be replaced over time with lower maintenance alternative
Objective 9b. Limit illegal trespass onto the site		
Action: Keep entry gate locked except during major events/activities	O	Currently underway
Action: Coordinate with Lane County to limit illegal access to the MRT property on the west side of the river	O	Currently underway
Action: Install locking gates in two locations	I	
Action: Install signage to clarify site boundaries and access restrictions	II	Currently underway
Action: Monitor trespass and vandalism -take appropriate actions.	O	Currently underway
Objective 9c. Provide facilities to support restoration and management activities, research, and public tours and events.		
Action: Maintain existing wells, pumps, and irrigation lines	RM	Currently underway
Action: Maintain existing outbuildings	RM	Currently underway
Action: Provide restroom facilities	RM	Currently underway
Action: Maintain passable trail access	RM	For tours and research access
Objective 9d. Manage vegetation to prevent conflict with utilities and prevent wildfire.		
Action: Maintain the areas under the BPA and EPUD power lines	RM	Currently underway
Action: Mow travel lanes as needed	RM	Currently underway
Objective 9e. Work to improve the visual quality along the main access road as it enters the site in the area just to the east of the low water crossing to create an attractive gateway for visitors.		
Action: Re-contour and smooth the disturbed areas along the entry rd.	II-III	In conjunction with proposed restoration
Action: Implement the proposed riparian and prairie restoration in the areas along the main entry road	II-III	In conjunction with proposed restoration
Action: Place entry signage along the main access road	II-III	Following restoration & phase-out of ag.
Goal 10: Adaptive Management Utilize an adaptive management model at Green Island to gauge the success and adjust future management.		
Objective 10a. Document the major enhancement and management efforts and activities as they occur.		
Action: Record the extent of management activities using GPS.	O	As activities occur
Action: Record locations, extent, and techniques used for management and enhancement activities	O	As activities occur
Objective 10b. Document and assess post-project conditions.		
Action: Establish cost effective monitoring strategies	I	Will result in efficiencies
Action: Utilize monitoring data to evaluate relative success of enhancement efforts and to inform future management.	O	Currently underway
Action: Incorporate findings from monitoring into future enhancement projects on Green Island.	O	Currently underway

Appendices

Appendix A

Historic Aerial Photos

Appendix B

Monitoring Activities Map

Appendix C

Green Island Bird Checklist

Appendix D

Green Island Complex Conceptual Habitat Map (USFWS 2006)