Chapter 5
Human Environment

USFWS

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5.1 Cultural Resources

Archaeological and other cultural resources are important components of our nation's heritage. The U.S. Fish and Wildlife Service (Service; USFWS) is committed to protecting valuable evidence of plant, animal, and human interactions with each other and the landscape over time. An example of an interaction would be the importance of specific plants to Kalapuya Indians, or the use of fire to burn open spaces that then provided habitat for elk and deer. These interactions may include previously recorded or yet undocumented historic, cultural, archaeological, and paleontological resources as well as traditional cultural properties and the historic built environment. Protection of cultural resources is legally mandated under numerous Federal laws and regulations. Foremost among these are the National Historic Preservation Act (NHPA) as amended, the Antiquities Act, the Historic Sites Act, the Archaeological Resources Protection Act (ARPA) as amended, and the Native American Graves Protection and Repatriation Act (NAGPRA). The Service's Native American Policy of 1994 articulates the general principles guiding the Service's relationships with Tribal governments in the conservation of fish and wildlife resources (USFWS 1994). Additionally, the Tualatin River National Wildlife Refuge (the refuge) seeks to maintain a working relationship and consult on a regular basis with the Tribes that are or were traditionally tied to lands and waters within the refuge.

Since cultural resources encompass many elements and time periods, the following simple temporal divisions were used to distinguish and categorize this brief review of the following resources.

- Pre-recorded history
- Pre-contact Native American traditions
- Post-contact traditions (Native American, Early British, and United States)
- Recent U.S. settlement and economic development period
- Historic and prehistoric sites on the refuge

Cultural resources can be of significant cultural, scientific, and educational importance. It is essential that the Service look beyond compliance with cultural resource laws to ensure protection of these nonrenewable resources. Of critical importance is the development of close working relationships with those that express affinity with the refuge's cultural resources, such as Native Americans, historians, and educators.

There are seven recorded prehistoric sites and six recorded historic sites within the refuge boundaries. Other historic sites and features may exist on the refuge that have not been recorded. Several prehistoric and historic sites and/or features have been recorded within 1 mile of the refuge.

Two of the historic sites within refuge boundaries have been evaluated and determined ineligible to the National Register of Historic Places (NRHP). One site has been determined eligible to the NRHP. It is highly probable that additional archaeological sites will be exposed by human actions or natural causes in future.

5.1.1 Prehistoric and Ethnographic Resources

5.1.1.1 Prehistoric and Ethnographic Setting of the Refuge Region

The meandering Tualatin River and its banks are home to native fish, beaver, deer, raptors, songbirds, and plants, all of which have been impacted as their habitats have been altered due to agriculture, urban development, and changes in land use practices. Yet these resources were abundant when the Atfálat'i (At-fahl-a-ti) Tribe of Kalapuya Indians lived, hunted, and gathered food on the Tualatin River floodplain.

Archaeological research on the refuge has revealed a history of humans hunting and gathering that dates back over 2,000 years. Camas, tarweed, and wapato were some of the most important plant foods. Long before the Wapato Lake Unit of the refuge was turned into an irrigated agricultural area by settlers in the late nineteenth century, it was an important place where all the villages of Atfálat'i Kalapuya gathered in autumn to harvest wapato. The Kalapuya routinely burned the valley floor for a variety of benefits: to increase grazing for game animals such as elk and deer, to maintain and spread camas habitat, to increase production of acorns, and to prepare for tarweed harvest, to name a few.

As Zenk (1976:358) reported:

> … each Tualatin winter-village group had its own tarweed-producing area within which individuals (at least, we would presume, wealthy individuals) owned their own sub-plots. These areas were set on fire about August. Women then went out with rawhide buckets and paddles; the seeds were beaten from the plants into the buckets. It is stated that each "lot" (individually owned plot) might produce 10-20 bushels of seeds.

Understanding these past land uses by the valley's original inhabitants offers critical lessons and has important ramifications regarding habitat restoration and management decisions on the refuge today. What food or tools they could not obtain along the river and its environs, the Kalapuyans obtained via trade with their neighbors. Obsidian, a volcanic rock used to make arrow points, has been found from as far away as the east side of the Cascades. Historical accounts (Zenk 1976) suggest that the Tualatin River Valley, including the area of the refuge, supported at least 20 native winter villages.

Wapato Lake was a major habitation location for the Tualatin Indians, also known as the Wapato Lake Indians, one of approximately 13 groups of Kalapuya people. The territory of the Kalapuyans extended throughout most of the Willamette River Valley as far south as the Umpqua River. Named for the wapato plant that grew in and was harvested from it, Wapato Lake served as a seasonal community gathering place for the bands of Kalapuyans.

The first recorded contact between Euro-Americans and the Kalapuyans occurred in 1812, when the Kalapuyan population may have been as great as 10,000 people. From 1812 to the 1840s, Kalapuyans had many contacts with fur traders. Though it occurred even before recorded contact, the smallpox epidemic of 1782-1783 and the later malaria epidemic of the 1830s had dramatic impacts on the Kalapuyan population, and on other native groups. Other new illnesses soon followed. By the 1850s there were few Atfálat'i left to claim their traditional lands, and the survivors were ultimately removed to the Grand Ronde Reservation.

Euro-American settlers began arriving in the 1840s, displacing the native population and turning the fertile Tualatin River bottomlands to agricultural purposes. Land clearing and the construction of

farming infrastructure such as dikes and ditches drained Wapato Lake and changed the landscape from one of riparian forest to agricultural fields. Towns grew up around the homes of the earliest settlers, intensified by the development of a Portland-to-Corvallis railroad that began in the late 1860s. Many towns bear the names of their founders or influential early landowners (e.g., Gaston, Seghers, Dilley).

Photo 5-1. For thousands of years, the Kalapuya people called Willamette Valley their home. Smithsonian Library (Wilkes 1845:223).

5.1.1.2 Known Prehistoric Sites

There are seven prehistoric archaeological sites recorded on the refuge. These sites are located throughout the refuge on both the Sherwood (three sites) and Wapato Lake (four sites) Units. In addition to the prehistoric sites, there is also a collection of artifacts donated to Portland State University by a private landowner. These artifacts came from property within and immediately adjacent to the refuge. Currently, the status and location of the collection is unknown. Table 5-1 summarizes the sites and surveys.

Table 5-1. Prehistoric Resources within Refuge Boundaries

Site#	Unit	Date Recorded	Site Type	Materials	NRHP Eligibility	Notes
35WN17	Wapato Lake	1977		Recorded based on informants' descriptions	Potentially eligible	State Historic Preservation Office (SHPO) report 11951 (testing)
35WN19	Wapato Lake	1977		Recorded based on informants' descriptions	Potentially eligible	SHPO report 9734 (survey)
35WN29	Wapato Lake	1982	Lithic scatter	Pestle, projectile points, fire-cracked rocks (FCR), charcoal	Potentially eligible	
35WN30	Wapato Lake	1982	Lithic scatter	Obsidian flake, FCR, basalt debitage	Potentially eligible	
34WN43	Atfálat'i	1997	Lithic scatter/FCR/artifact concentration	Period III (40000 BC-250 BC) and Period IV (250 BC-AD 1700)	Eligible	Tested
34WN44	Atfálat'i	1997	Lithic scatter/FCR/artifact concentration		Potentially eligible	
35WN46	Atfálat'i	2001	Lithic scatter		Eligible	Tested

5.1.2 Historic Resources

5.1.2.1 Known Historic Sites

Parcels acquired within the approved boundaries of the Tualatin River National Wildlife Refuge often come with standing structures associated with the area's agricultural history. After being acquired, several of these historic farm complexes and/or residential structures have been

documented and evaluated by the Service's Cultural Resources Branch (Table 5-2). Upon evaluation and determination of noneligibility to the NRHP, the subject buildings may be slated for removal through demolition and salvage if they pose a risk to humans or wildlife. In one case, a historic structure was determined eligible, and the necessary documentary steps were taken to mitigate its removal in compliance with the NHPA.

Photo 5-2. Onion barns are part of the historic structure of the refuge. Nick Valentine/USFWS.

Table 5-2. Historic Resources within Refuge Boundaries

Site Name	Site Type/Features/ Materials/Notes	Condition (integrity)	NRHP Eligibility
Cranfield Homestead	Estimated located as per 1852 General Land Office (GLO) map (GLO 1952)	Some brick/ceramic/glass observed	N/A
McKinney Field	Estimated located as per 1852 GLO map	No existing evidence	N/A
White-Ditmman Onion Barn	Onion barn reflecting agricultural function. A memorandum of agreement (MOA) was prepared to document it before demolition	Demolished	Eligible
Naujock House	Built in 1891 by emigrants from Germany who arrived in the area in 1876. Replaced earlier log house	In use, modified	Not eligible
Naujock Barn and	Gambrel roof barn, built in	Not in use	Not eligible

Table 5-2. Historic Resources within Refuge Boundaries

Site Name	Site Type/Features/ Materials/Notes	Condition (integrity)	NRHP Eligibility
Granary	1930s along with brick building (granary and potato cellar). SHPO recommended retaining or if necessary, salvaging site		
Cereghino Farm Complex	Onion drying barn, house, and outbuildings associated with onion farm complex. House is used for office space and other buildings are used for storage or are vacant		Not evaluated

5.2 Refuge Facilities

There are numerous refuge facilities that require upkeep and maintenance, which are performed by one maintenance employee and volunteers, as available. These facilities serve both the visitor services and biological programs, and range from boundary fencing to residences to public use facilities. In addition, there are structures that serve as offices for other Service programs, such as the Cultural Resources Program Office.

5.2.1 Boundary Fences and Markers

There are approximately 8.4 miles of boundary fence around various tracts of the refuge. The majority of the fencing is around tracts on the Riverboat Unit.

5.2.2 Entrance and Access Points

The primary public entrance to the refuge, opened in 2006, is from Oregon State Highway 99W, between Sherwood and King City. This entrance is allowed through a permit issued by the Oregon Department of Transportation (ODOT) and was constructed according to ODOT specifications, which do not include a deceleration lane from the highway to the refuge or an acceleration lane from the refuge to the highway. This has caused some safety concerns for visitors. Four state highway recreation signs direct visitors into the refuge. A secondary public entrance off of Washington County's Roy Rogers Road provides access to the west side of the Atfálat'i Unit and the Wayside Overlook (see Figure 5-1 and Appendix P, Map 10). There are no other public access points to the refuge. The refuge has provided input to a number of regional trail planning projects that have the potential of connecting to refuge access points. These include Tonquin Trail planning by Metro, a tri-county regional government that serves Multnomah, Clackamas, and Washington Counties; Cedar Creek Trail planning by the City of Sherwood; and West Bull Mountain Concept Plan by Washington County.

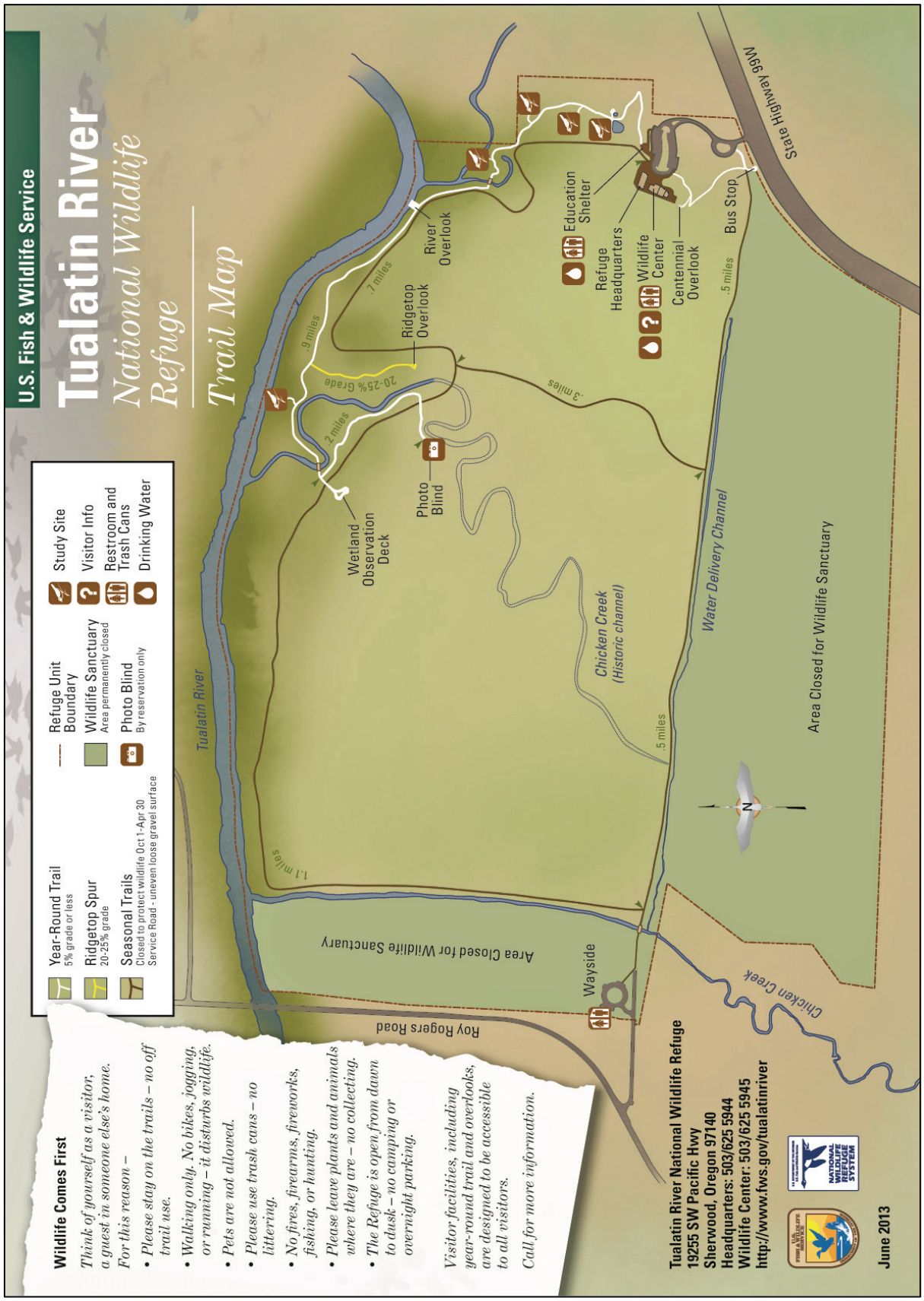

Figure 5-1. Public use facilities and regulations.

5.2.3 Administrative Facilities

Administrative facilities are located on the Atfálat'i Unit of the refuge. The 4,058-square-foot refuge headquarters, completed in 2007, includes staff offices and other work area amenities consisting of a documents work area, conference room, reception area, and space for volunteers. New facilities, including the refuge headquarters, Wildlife Center, environmental education shelter, fee collection booth, and parking lots have all been designed and constructed to meet sustainable design standards of the silver level of LEED (Leadership in Energy and Environmental Design). There is a fire suppression pump and a water storage building that serves the public use facilities and refuge headquarters.

There are other refuge buildings being used by Service Regional Office employees as offices including the Cultural Resources Program Office located at the Onion Flats Unit.

The shop area on the Tualatin River Unit contains facilities that include a 3,750-square-foot shop containing the maintenance office, vehicle/equipment repair bays, and tool storage. There are another six buildings located at the shop area that support refuge maintenance functions. These include three pole barns used for equipment storage, a hazardous materials storage building, a wooden lean-to for equipment implement storage, and a storage shed for environmental education materials.

The refuge has numerous barns, outbuildings, and homes (houses and mobile homes) that came with the land when property was acquired. Many of these buildings are in poor condition and need to either be demolished or undergo a complete overhaul to be functional. There are seventeen barns and outbuildings scattered throughout the Sherwood Units and four at the Wapato Lake Unit. Along with the barns and outbuildings, there are two houses and one manufactured trailer on the Sherwood Units, and two homes and one manufactured trailer at the Wapato Lake Unit. Altogether, there are 31 buildings on the refuge.

5.2.4 Roads, Trails, and Parking Areas

Tualatin River National Wildlife Refuge opened its Atfálat'i Unit to the public in 2006 after two years of construction that provided access from adjacent highways and a variety of outdoor wildlife recreation and education features. Roads and parking features include: a 0.3-mile headquarters entrance road and bus turnaround with parking for 60 cars plus three buses/recreational vehicles (RVs); a 0.1-mile wayside entrance road with parking for six cars and one RV; and five bicycle racks. In the fall of 2010, both entry roads and parking lots were upgraded from gravel to a combination of pervious paver parking stalls and asphalted driving lanes—all stormwater flows into a bioswale in the center of the parking areas. The bioswale is designed to both slow the rate of stormwater runoff and provide natural filtration and water quality treatment.

Trail features include: a 1.1-mile year-round trail; a 0.2-mile photography blind spur trail; two foot bridges; a 3.1-mile seasonal trail, which is part of a gravel refuge road used by staff; a plaza overlook; a bioswale overlook; a wetland observation deck; a wayside overlook; a river overlook; a wildlife photography blind; and five environmental education study sites. All trail features were opened with the refuge in 2006, except for the bioswale overlook, which was completed in 2011. Numerous informational, regulatory, and directional signs are located throughout the refuge's public use areas. The refuge is open daily from dawn to dusk. To provide these high-quality facilities and maintain compatible wildlife-dependent recreation, dense riparian vegetation plantings were planted

in 2004 and 2005 along the planned trail corridor. These screens now provide “natural blinds” where visitors can observe wildlife while minimizing disturbance to the wildlife they are enjoying.

There are roads and parking areas that are not open to the public and serve solely administrative functions. Parking lots for the various residences and other structures include tracts on the Riverboat Unit (Harmon and Naujock tracts), Onion Flats Unit (Cereghino tract), Riverboat Unit (Dennis tract), and Wapato Lake Unit (Losey and Beecher tracts) and total 64,826 square feet of gravel and asphalt lots. Administrative roads throughout the refuge total 11.5 miles and are used to access areas for habitat management and maintenance. These roads are mostly gravel and require regular maintenance and upkeep. There is also a concrete road bridge that crosses Chicken Creek on the Atfálat’i Unit.

Photo 5-3. Wetland observation deck. USFWS.

5.2.5 Visitor Facilities

Outdoor facilities are complemented by a state-of-the-art, sustainably built Wildlife Center, which opened in 2008. The Wildlife Center encompasses 6,316 square feet, and includes an exhibit room, environmental education field laboratory, information desk, a Friends of the Refuge nature store, an indoor viewing area, and a multipurpose room. The center is currently open Tuesday through Sunday year-round. The center is typically closed on major holidays and for one to two weeks spanning the New Year holiday. Friends of the Refuge help staff the daily operation of the center by recruiting and training volunteers. The environmental education shelter, designed primarily to provide cover and education space for students visiting the refuge, was completed in the fall of 2010. The shelter can accommodate up to 65 students at a time. Approximately 25 percent of refuge visitors and students visit the Wildlife Center and/or environmental education shelter annually.

Photo 5-4. Wildlife Center. Kim Strassburg/USFWS.

5.2.6 Easements and Agreements

There is an intergovernmental agreement in place between the Service and Metro that has established a framework for the refuge to manage a portion of a property owned by Metro known as the Heritage Pine Natural Area. The property is approximately 50 acres in size, and the Service is performing restoration of a mixture of bottomland riparian forest, herbaceous wetland, and wet prairie habitats. Additionally, the Service is responsible for all funding, restoration, management, operations, and maintenance of the property. This agreement is for 10 years, with the option to extend upon agreement by both parties.

In 1992, the Service purchased a voluntary conservation easement on what is now the Wapato Lake Unit to manage the land for the purpose of habitat restoration. In agreement with the landowner, the refuge has the right to establish or reestablish habitat through various management tools. The purposes of this easement are the preservation and maintenance of wetland and floodplain areas as well as protection and enhancement of plant and animal habitat and populations. Easements are a cost-effective method of conservation, allowing us to work with landowners to protect the habitat on their land.

There are also several access easements that allow staff to access refuge property via private property. These are located at the Onion Flats, Riverboat, and Wapato Lake Units.

Photo 5-5. Water control structure. USFWS.

5.2.7 Dikes, Irrigation, Water Control Structures, and Pump Houses

The refuge manages herbaceous wetlands on several units. To manage these wetlands, the refuge manipulates water levels using a system of dikes, levees, water control structures, and pump houses. For the Steinborn tract on the Atfálat'i Unit, the main source of water is Chicken Creek, which was channelized to facilitate farming and is diverted to an irrigation canal to allow further diversion into specific wetland impoundments. At the point where Chicken Creek enters the refuge, there are fish ladders that were installed to facilitate fish movement past the diversion structure from the river to headwaters. There is also a fish screen in place to prevent fish from moving into the irrigation canal. To move the water through the five impoundments totaling 234 acres, a system of 15 water control structures and 2.23 miles of levees and dikes are used. There is a dilapidated pump that was used prior to refuge acquisition for farming and irrigation purposes. The refuge does not use the pump for its habitat management purposes.

The other tract on the Atfálat'i Unit that has managed wetlands is the Heritage Pine Natural Area, which is managed by the Service under a cooperative agreement with Metro, as described in Section 5.2.6. This unit has one herbaceous wetland of 6 acres that is managed by one water control structure, and receives water only from rainfall.

On the Tualatin River Unit, there are five wetland impoundments totaling 35 acres on the Dennis tract. Four of these are seasonal and rely on rainfall as their source of water. The main impoundment is also seasonal and is fed primarily by rainfall supplemented by a pump that uses water from the Tualatin River. The system for this unit contains one water control structure, the aforementioned pump, and 0.40 mile of levees and dikes.

On the Riverboat Unit, 48 acres make up four wetland impoundments that are managed by a system of two water control structures, three low-capacity wells, and 0.10 mile of levees and dikes. All four

wetlands received their water primarily from rainfall; however, the main wetland unit can also get limited water pumped from the wells.

There is a concrete pumphouse located on the Onion Flats Unit that was historically used for irrigation purposes prior to refuge acquisition. This pumphouse has fallen into disrepair and is not used by the refuge for habitat management purposes.

5.3 Public Use Overview

5.3.1 Public Use Program History

One of Tualatin River National Wildlife Refuge's current management priorities is to "provide high quality opportunities for wildlands and wildlife-dependent recreation and environmental education to enhance public appreciation, understanding, and enjoyment of the refuge's fish, wildlife, habitats, and cultural resources, with emphasis towards urban residents" (USFWS 2003a). This stems from the refuge's establishment under the guidelines of the Service's Urban Refuge Policy (341 FW 1) (Smith 1991), which strives to connect large populations of people to the concept of national wildlife refuges. In addition, the communities surrounding the refuge have expressed a desire for the refuge to provide a natural legacy where future generations can enjoy and learn about the outdoors. This foundation has led to a robust public use program at the refuge. The overarching goals of the visitor services program closely mirror national efforts to implement one of the six highest priorities of the Service, namely "Connecting People with Nature—Ensuring the Future of Conservation" (USFWS 2008b).

5.3.1.1 Visitor Experience

The protection of fish and wildlife and their habitats on the refuge provides the public with high-quality wildlife-oriented recreation, education, and interpretation opportunities. Visitors of all ages can experience the beauty of the Tualatin River Valley, view abundant wildlife, and discover how this urban national wildlife refuge represents the National Wildlife Refuge System (Refuge System). The Wildlife Center serves as a springboard by introducing the public to the refuge and its purposes, helping visitors hone their wildlife observation skills, and encouraging visitors to get outside and experience first-hand the wildlife wonders of the refuge. Throughout their visit, whether walking on trails, participating in an education program, or enjoying exhibits, visitors are reminded that they play a role in the health and future of the refuge, the watershed, the Refuge System, and ultimately of fish and wildlife conservation.

5.3.2 Open and Closed Areas

The Atfálat'i Unit is open year-round during daylight hours for wildlife-dependent recreation and education. Access within this unit is limited to defined public use areas. Most of the use originates from the headquarters parking area and Wildlife Center, and is concentrated along the year-round trail and its associated features (see Figure 5-1 and Appendix P, Map 10). The spur trail to the wildlife photography blind is open year-round by registration only. From May 1 through September 30, visitors are permitted to walk on 3.1 miles of service roads. From October 1 through April 30, these service roads are closed to all public entry to provide sanctuary for wildlife.

All other areas of the refuge are currently closed to public use.

5.3.3 Annual Visitation

Demand for interpretive and educational programs has soared, and visitation has been increasing steadily since the refuge opened to the public in 2006. Current visitation is approximately 100,000 people per year, 4,000 of whom participate in formal, curriculum-based education programs (USFWS 2010a). Since the Wildlife Center opened in 2008, it has received as many as 25,000 annual visitors. Projections indicate that refuge public facilities could serve an estimated 200,000 to 300,000 visitors annually (USFWS 2003b).

5.3.4 Entrance and User Fees

In 2009, the refuge received official approval to establish an entrance fee program, but it has not implemented one to date (USFWS 2009a). Implementation of a fee program remains a possibility in the future and has been described in Chapter 2, Section 2.3, "Description of Management Direction."

A fee booth was constructed in 2008, but is currently unused. Each of the three trailhead kiosks include a fee canister and a sign explaining a potential future fee program.

5.3.5 Accessibility of Recreation Sites and Programs to Disabled Persons

Except as noted below, all refuge public use facilities are accessible to disabled visitors and conform to standards set forth in the Architectural Barriers Act (42 U.S. Code 4151 et seq.).

The exceptions are:

- The 200-yard spur trail to the Ridgetop Overlook reaches a maximum grade of 20 percent, but is designed to be wheelchair-accessible in all other respects.
- The 3.1 miles of service roads open to seasonal public use consist of uneven gravel surfaces.

5.3.6 Volunteers

The refuge has a robust volunteer program that is essential to maintaining current refuge operations. With the exception of law enforcement, personnel management, contracting, and select other functions prohibited by law, volunteers are involved in almost all aspects of the refuge's visitor services and habitat and wildlife programs. In fiscal year 2010, volunteers donated over 15,000 hours of support to the refuge (USFWS 2010a). This equals more than seven full-time personnel and is valued at more than $327,000 (national volunteer value = $21.79/hour [Independent Sector 2011]). Over 75 percent of the hours contributed were in support of wildlife-dependent public uses.

Photos 5-6 and 5-7. Volunteers assist with many aspects of refuge operations. USFWS.

5.4 Wildlife-dependent Public Uses

5.4.1 Hunting

Currently, hunting is not offered on the refuge.

5.4.2 Fishing

Currently, fishing is not offered on the refuge.

5.4.3 Wildlife Observation and Photography

The refuge provides a variety of facilities and programs that support high-quality wildlife observation and photography. Both the year-round and seasonal trails offer overlooks and observation points. For a complete description of trail lengths and features, refer to Section 5.2.4, "Roads, Trails, and Parking Areas." Nearly 70,000 pedestrians used the trails in fiscal year 2010. In addition, the refuge is a stop along the Willamette Valley Birding Trail and has been designated by the Audubon Society as an Important Bird Area.

The wildlife photography blind can be reserved at no charge on Wednesdays, Saturdays, and Sundays. The blind can accommodate two photographers at a time. Wildlife observation supporting materials are available to visitors, and include a spotting scope (indoor viewing area), Discovery Packs (loaner field guides and binoculars at no charge), wildlife sightings register, and refuge Watchable Wildlife checklist. In addition, numerous interpretive signs along the trail and within the Wildlife Center are designed to help visitors develop wildlife observation skills and learn about the specific wildlife and habitats of the refuge. The Wildlife Center also includes a gallery hall with a picture hanging system that primarily highlights refuge wildlife and nature photographs from photography contests, calendar entries, and student projects. Nearly 1,800 people participated in wildlife photography activities in fiscal year 2010.

Programs offered for wildlife observation and photography activities include partner-led bird walks, Friends of the Refuge's Tualatin River Photographic Society (workshops, trainings, monthly meetings, and nature photography contests), plant walks led by a volunteer botanist, and others as staff/volunteers are available. Additionally, Volunteer Trail Rovers welcome, meet, and interact with visitors along the trail, report wildlife sightings and visitor contacts, and help ensure visitor compliance with refuge rules.

Photo 5-8. Sunset wildlife watcher. Kim Strassburg/USFWS.

5.4.4 Environmental Education

The refuge, in coordination with local educators, has developed a robust curriculum-based environmental education program that is blossoming into a metropolitan resource for teachers, students, youth group leaders, and families. The environmental education program is a key focus of refuge public use activities.

In 2005, the refuge and Friends of the Refuge partnered with a team of elementary and middle school teachers to develop and implement an environmental education program that would be in place by 2006, when the refuge was to open to the public. The result was a written curriculum called *Rhythms of the Refuge: Open Your Eyes to Wildlife*. This curriculum includes a field trip guide and pre-visit, on-site, and post-visit lessons for kindergarten through eighth-grade students. The refuge also supports the use of and offers workshops for national curricula such as *Project Wild*; *Project Flying Wild; Project Learning Tree*; *Growing Up Wild*; *Project Aquatic Wild*; *and 4H Wildlife Stewards*. Modeled after other national wildlife refuge programs, the curriculum is paired with required teacher workshops that prepare educators to bring their students to the refuge, relying on teachers to lead field trips and refuge volunteer naturalists to assist and accompany class visits. The day-to-day coordination of the education field trip program is generally managed by interns, grant-funded short-term staff, and volunteers. Environmental education training for staff/volunteers consists of a four-day class for volunteer naturalists; on-the-job shadowing for interns; coaching by refuge staff and long-term volunteers; online college courses for staff/interns; and regional workshops/trainings with partners. The emphasis on training has resulted in a high-quality program that follows national and statewide standard practices for environmental education.

The refuge offers facilities and equipment specifically in support of the environmental education program. These include a classroom and student patio that accommodates 36 students; the environmental education shelter, which accommodates 65 students; trailhead restrooms; five study sites along the year-round trail, each of which accommodates 15 students at a time and provides exposure to different habitat types on the refuge; learning materials (e.g., study skins, microscopes, craft supplies); and field investigation equipment (e.g., binoculars, field guides, water quality test kits).

The education program has developed strong partnerships within the community that facilitate quality education. Examples of partners include Friends of the Refuge, Oregon Natural Resources Education Program (Oregon State University), Sherwood School District, 4-H (Oregon State University), Tualatin Riverkeepers, Sherwood Foundation for the Arts, and YMCA of Sherwood.

On-site programs: In fiscal year 2010, the refuge provided teacher workshops for 280 educators. Those who attend the workshops can register their classes to visit the refuge for a field trip. A maximum of 70 students, plus required chaperones, can be accommodated at any given time. In fiscal year 2010, 1,306 students participated in on-site field trip programs. Although no formal program is offered for high school and college students, the refuge will tailor a visit based on the needs of the students/classes. Local schools occasionally transport physically and learning-disabled students to the refuge for short walks and/or visits to the Wildlife Center. No programs currently exist for these students; however, volunteers will welcome and orient groups as needed. The refuge also draws youth groups for whom learning occurs outside the formal school day. Examples include boy/girl scouts, after-school clubs, summer youth programs and day camps, and pre-school. In fiscal year 2010, 917 students attended informal youth programs.

Off-site programs: The refuge participates in off-site programs when funding and staff are available. Examples of such programs include school-based nature festivals/events, outdoor schools, career days, and special requests. In fiscal year 2010, 1,665 students participated in off-site environmental education programs.

Photo 5-9. Students explore and learn at the refuge. USFWS.

5.4.5 Interpretation/Outreach

The refuge has a variety of interpretive and informational media and programs that strive to accomplish a number of objectives, such as welcoming and orienting visitors; conveying the importance of native wildlife, their habitats, and the interconnectedness of lands and waters; encouraging nature exploration and appreciation; exploring the refuge's cultural history; describing the refuge's resources; introducing the Refuge System; and describing ways in which people are part of and can help care for the natural environment. All interpretive approaches follow the basic tenets of the Service's Interpretive Development Model (605 FW 7, Interpretation). Staff and volunteers are offered training in interpretive techniques.

Interpretive facilities include a 1,200-square-foot exhibit hall within the Wildlife Center; numerous outdoor interpretive panels, kiosks, sculptural elements, and trailside signs; temporary exhibits in the atrium of the Wildlife Center; and publications such as general leaflets and trail maps. Outreach tools include the refuge website; online and printed calendar postings by local partners such as Washington County Visitors Association and Metro Greenscene; newspaper articles and radio spots; flyers; complementary online media such as the Friends of the Refuge website and Facebook page; and the Tualatin River Bird Festival website.

A number of "in-person" interpretive programs are typically offered throughout the year, generally led by staff, volunteers, and partners. These are scheduled opportunistically depending on staff and volunteer availability and expertise. Nearly 2,500 people attended interpretive programs in fiscal year 2010. These programs included owl prowls; nature tours; plant identification walks; birding tours;

Puddle Stompers pre-school program; and workshops (e.g., rain gardens, birding). Oftentimes, other organizations bring visitors in large groups to either participate in refuge-led activities or to participate in wildlife-dependent activities on their own (e.g., senior groups, Audubon Society outings, walking clubs). The refuge requires that groups larger than 15 people but not exceeding 50 people register ahead of their visit, and while at the refuge, follow a certain set of requirements. Key requirements include breaking large groups into groups of 15 or fewer people and staggering these smaller groups along the trail; encouraging carpooling; and not charging participants commercial guiding fees. The refuge does acknowledge that group organizers may recover operating costs, such as transportation, for visits to the refuge.

Several on-site special events occur on the refuge. The primary event, held annually in May, is the Tualatin River Bird Festival, which is hosted in partnership with Friends of the Refuge. Starting in May 2011, the event grew from a one-day festival with an average of 700 attendees to a three-day festival that attracted over 3,500 participants. Other smaller events, offered less frequently, include National Wildlife Refuge Week, Spring Break Exploration Days, Family Adventure Days, and a native plant sale, attracting 100 to 200 participants each. Refuge staff and/or volunteers attend local off-site special events as schedules and funding allow. Common off-site venues include nature festivals and health fairs, reaching 300 to 500 people annually.

Photo 5-10. Interpretive programs connect visitors to refuge resources. Bjorn Fredrickson/USFWS.

5.5 Non-wildlife-dependent Recreation

Non-wildlife-dependent recreation activities are not permitted on the refuge. Kiosks, brochures, and informational and regulatory signs articulate prohibited activities.

5.6 Illegal Uses and Law Enforcement

Law enforcement issues that currently occur on the refuge are primarily trespass in closed areas, presence of dogs, jogging and bicycling, and other non-wildlife-dependent uses. Other illegal uses

include low-flying aircraft, trash dumping, theft (vehicle break-in, stolen gas and tools), and using the refuge facilities to access and steal from neighboring business. These illegal uses persist due to lack of public knowledge and support as well as limited law enforcement capability. Currently there is a zone law enforcement officer stationed at the refuge, but their duties require them to be frequently off-site.

5.7 Area Outdoor Recreational Opportunities and Trends

5.7.1 Nearby Recreational Opportunities

The refuge lies just 15 miles southwest of downtown Portland and is located within the Portland metropolitan area, which is known for its natural areas and parks. Metro boasts over 16,000 acres of protected lands, most of which are open to the public. In addition, the greater Portland area is home to thousands of acres of local/city parks, gardens, arboretums, state and local wildlife areas, state parks, nature centers, multi-use trails, and the 5,000+ acre Forest Park. Many of these areas are connected by bike, pedestrian, and boat corridors. These nearby facilities provide a wide range of recreational opportunities such as hiking, bicycling, wildlife observation, fishing, hunting, picnicking, environmental education, interpretation, guided nature tours, outdoor photography, nature festivals, camping, canoeing/kayaking/rafting, sports, and agritourism sites (e.g., vineyards and "u-pick" produce and tree farms). Portland sits at the mouth of the Columbia River Gorge Scenic Area and is the closest major city to Mount Hood and Willamette National Forests. The highways that skirt the refuge are major corridors providing access to the Oregon coast.

5.7.2 Outdoor Recreation Trends and Demographics

Participation in wildlife-associated recreation has been measured by the Service to determine trends and economic impacts, both at national and state levels. The latest survey, completed in 2006, found that 87.5 million (over 38%) of U.S. residents 16 years and older participated in wildlife-related recreation. During that year, 30.0 million people fished, 12.5 million hunted, and 71.1 million participated in at least one type of wildlife-watching activity such as observing, feeding (e.g., backyard bird feeders), or photographing fish and other wildlife in the United States. Participation by Oregonians is higher than the national average. In 2006, 53 percent of Oregonians participated in wildlife-associated recreation, both within and outside of Oregon. More specifically, 44 percent of Oregonians participated in wildlife-watching and 19 percent in hunting and fishing (U.S. Department of the Interior [USDOI] et al. 2007).

Oregon Parks and Recreation Department (OPRD) is responsible for providing guidance, information, and recommendations to Federal, state, and local units of government, as well as the private sector, in making policy and planning decisions regarding outdoor recreation in Oregon. They do this in the Statewide Comprehensive Outdoor Recreation Plan (SCORP). The latest SCORP is a five-year plan covering outdoor recreation in Oregon from 2008 through 2012 (OPRD 2008).

The OPRD began the SCORP planning process in September 2005. The agency took a proactive approach in addressing a limited number of previously identified and defined issues. Key findings from the 2008-2012 SCORP and the 2005-2014 statewide trails planning efforts identified a number of important demographic and social changes specifically facing outdoor recreation providers in the coming years, including: 1) a rapidly aging Oregon population, 2) fewer Oregon youth learning outdoor skills, and 3) an increasingly diverse Oregon population. An additional identified issue

related to human health is the physical inactivity within the population. Key findings especially relevant to the Service regarding these issues are summarized below.

A Rapidly Aging Oregon Population

- On average across all activities, respondents expect to spend 28 percent more days recreating 10 years from now than they currently do.
- The most popular outdoor recreation activities for Oregonians between the ages of 42 and 80 included walking, picnicking, sightseeing, visiting historic sites, and ocean beach activities. A comparison across age categories for the top five activities by the level of participation leads to the following conclusions: Walking is the top activity across all age categories (40-79); jogging is a top activity between the ages of 40-59, but is also popular for those in their 70s; bicycling is a top activity between the ages of 40-64; sightseeing is a top activity between the ages of 45-74; bird watching is a top activity between the ages of 55-79; and RV/trailer camping is a top activity between the ages of 55-74.
- The top five activities in terms of future participation intensity 10 years from now included walking, bicycling, jogging, bird watching, and day hiking.
- Ensuring clean and well-maintained parks and facilities was the most important management action leading to a large increase in recreation, followed by developing walking/hiking trails closer to home and providing more free-of-charge recreation opportunities.
- Over a third of Oregon Boomers, people born between 1946 and 1964, and Pre-Boomers, who were born between 1926 and 1945, volunteered in their community, with an average time commitment of 5.3 hours per week. Of those who volunteered, 43 percent expect future changes in their volunteer activities, with most of the changes involving greater volunteerism: more time, more projects at current volunteer opportunities, and new volunteer opportunities.

Fewer Oregon Youth Learning Outdoor Skills

- The most popular outdoor activities for parents were walking, viewing natural features, and relaxing/hanging out. For children, the most popular were walking, followed by outdoor sports/games, relaxing/hanging out, and general play at neighborhood parks/playgrounds.
- The more a parent engages in an outdoor recreation activity, the more their child does. Participation varies across child age, with both the number of activities and the number of activity-days peaking among 12 to 14 year olds and decreasing for 15 to 17 year olds.
- Rural children spend more days, on average, in outdoor activities relative to urban and suburban children. Suburban children spend the least amount of days engaged in outdoor activities. Outdoor abilities have decreased more, on average, among urban and suburban households.
- Outdoor sports programs and day camps were the most popular types of outdoor recreation programs with respect to past participation. Many parents indicated that it was very likely their children would participate in outdoor sports programs (62%), multiday camps (49%), outdoor adventure trips (45%), and day camps (45%) in the future.

An Increasingly Diverse Oregon Population

- Walking for pleasure was the most common favorite activity for both Hispanics and Asians, with fishing and soccer being the next most common for Hispanics and hiking and fishing the next most common for Asians.
- Both Hispanic and Asian study respondents most commonly did their favorite activity with members of their immediate family. Asians were more likely than Hispanics to do activities alone, as were older respondents relative to younger respondents.
- The most common location for Hispanic and Asian respondents to do their favorite activity was in a park or other area outside their town or city. Males were more likely than females to engage in their favorite activity further from home.
- Survey results suggest that both the Hispanic and Asian populations in Oregon engage in outdoor recreation less than the general population.
- Walking for pleasure was also the activity respondents spent the most days engaged in during the past year. Hispanics engage more intensely than Asians in jogging/running, day hiking, picnicking, fishing, viewing natural features, visiting nature centers, and visiting historic sites.
- The most common activities respondents would like to do more often, or start doing, were walking for Asians and walking and camping for Hispanics. The factor that would most help make this happen is availability of partners, followed by more time.
- For the Hispanic population, being in the outdoors, relaxing, and having fun were the most important motivators or reasons for participating in outdoor activities. For the Asian population, relaxing, fitness, and having fun were the top motivators.
- Ensuring clean and well-maintained parks and facilities were the most important management action, followed by keeping parks safe from crime and providing more free-of-charge recreation opportunities and expanded facilities.

Several management recommendations from the SCORP are relevant to the types of outdoor recreation Tualatin River National Wildlife Refuge provides; relevant recommendations from the SCORP are as follows:

- Develop accessible trails in remote settings in close proximity to urban areas of the state.
- Create a statewide interagency volunteer information website or other communications medium to match Boomer volunteers with recreation or natural resource projects in Oregon.
- Greater priority for trail acquisition and development projects in OPRD-administered grant program (Multnomah, Clackamas, and Washington Counties are considered “high priority” based on increase in aging population).
- Develop a statewide youth outdoor programming framework and funding source to focus youth programming efforts across Oregon to address a specific set of key measurable objectives.
- Create a new Outdoor Recreation Section within Oregon Recreation and Park Association addressing the areas of outdoor recreation and environmental education.
- Provide funding and assistance for innovative park designs to connect youth with nature in high-priority counties and communities … in OPRD-administered grant programs (Multnomah, Clackamas, and Washington Counties are considered “high priority” based on increase in youth population).
- Encourage organizational cultural change within public recreation agencies/organizations to effectively address the diversity issue.

- Develop recommendations for addressing language barriers to encourage underrepresented population use of outdoor recreation facilities and programs
- Create a customer service training module related to serving the outdoor recreation needs of an increasingly diverse population.
- Develop and implement a regional youth framework to encourage underrepresented youth participation in outdoor recreation activities through partnerships and investments in school-based recreation clubs.

5.8 Socioeconomic Environment

5.8.1 Population and Area Economy

Oregon's population (3,782,991) ranks twenty-seventh in the nation. State land area covers 95,997 square miles compared to 3,537,438 square miles (United States), with a population density of 40 persons per square mile compared to 87 nationwide. Located in Washington and Yamhill Counties, Tualatin River National Wildlife Refuge is a 30-minute drive from downtown Portland and only minutes away from the Cities of Sherwood, Tigard, Tualatin, Newberg, Forest Grove, and Hillsboro.

The greater Portland metropolitan area, including Washington, Multnomah, Clackamas, Yamhill, and Marion Counties, is the economic hub for the refuge. Table 5-3 shows the population and area economy. Between 1999 and 2009, the population of Oregon increased 11 percent compared with a 10 percent increase for the United States as a whole. Employment for Clackamas, Marion, and Yamhill Counties increased at a greater rate (see Table 5-3) compared to the rest of Oregon (8 percent) and the United States (8 percent). Only Yamhill and Marion Counties exceeded the increase in per capita income compared with Oregon and the United States as a whole (USFWS 2011b).

Table 5-3. Tualatin River National Wildlife Refuge Summary of Area Economy, 2009

	Population		Employment		Per Capita Income	
	2009	Percent change 1999-2009	2009	Percent change 1999-2009	2009	Percent change 1999-2009
Clackamas County	386.1	15%	219.2	18%	$44,362	−1%
Marion County	318.0	13%	173.2	10%	$33,415	5%
Multnomah County	726.9	11%	560.5	4%	$41,154	3%
Washington County	537.3	23%	284.1	6%	$40,112	−3%
Yamhill County	99.0	17%	44.0	13%	$33,434	9%
Oregon	3,825.7	11%	2,202.7	8%	$36,785	4%

Table 5-3. Tualatin River National Wildlife Refuge Summary of Area Economy, 2009

	Population		Employment		Per Capita Income	
	2009	Percent change 1999-2009	2009	Percent change 1999-2009	2009	Percent change 1999-2009
United States	307,006.6	10%	173,809.2	8%	$40,285	9%

Source: U.S. Department of Commerce 2011.

Note: Population and employment are in thousands; per capita income in 2010 dollars.

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