KLAMATH WILDLIFE AREA MANAGEMENT PLAN

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Executive Summary

Purpose of the Plan

This plan will guide management of Klamath Wildlife Area (KWA) for the next 10 years. Purposes of this plan are:

- To provide clear direction for management of KWA;
- To provide long-term continuity in wildlife area management;
- To communicate the department's management priorities for KWA to its neighbors, visitors, and the public;
- To ensure management programs on KWA are consistent with the original mandate and purpose of the area when first established;
- To ensure management of KWA is consistent with Federal, State, and local natural resource plans,
- To ensure management activities address conservation priorities and recommendations described in the 2016 Oregon Conservation Strategy, and;
- To provide a basis for budget requests to support KWA needs for staffing, operations, maintenance, and capital improvements.

Historical Background

Following droughts in the 1930s that affected most of North America, major conservation efforts both private and governmental were enacted to reverse trends of degrading and disappearing wetlands. During this time period there was a major creation and expansion of Federal refuges and State wildlife areas. As the concept of waterfowl flyway management was endorsed and developed, wildlife areas were acquired and managed as part of a larger plan focused on migratory waterfowl needs. KWA was one of several wetland-focused wildlife areas established in Oregon.

KWA was established in 1958, with primary objectives of protecting and improving waterfowl habitat and providing a public hunting area. The wildlife area consists of four parcels of acreage in Klamath County, in south-central Oregon. The largest parcel is located along State Highway 97, six miles south and west of Klamath Falls and an additional parcel is located six miles downriver. The other two parcels are on the west side of Upper Klamath Lake. The wildlife area is 3,412 acres in size at present.

Due to its geographic setting, species diversity and abundance of wildlife present, KWA is a popular destination for hunting, wildlife viewing and environmental education.

Planning Approach

This plan revises the 2007 revision of the original long range plan for KWA initially adopted by the Oregon Fish and Wildlife Commission (Commission) in 1993. Goals, objectives and actions (strategies) described in this 2018 revised plan were derived using an ecosystem-based management philosophy. This plan takes a strong

habitat-based approach with the description of wetland habitat types within the goals and objectives following the classification scheme of Cowardin et al. (1979). Of primary importance, most management actions undertaken on KWA are for the benefit of wildlife, and public use must be compatible with sustainability of wildlife resources.

This plan describes current issues and provides actions to address them. These actions will be implemented during the life of this plan, but are subject to availability of funding and personnel availability. This management plan will be reviewed in 2023 to gauge the progress of implementation and make necessary revisions, and it will be revised in its entirety in 2028.

Klamath Wildlife Area Vision

The vision for Klamath Wildlife Area is:

The protection and enhancement of habitat for all endemic wildlife using sound stewardship measures; providing wildlife resources for use and enjoyment by present and future generations while reducing waterfowl depredation on adjacent private lands.

Wildlife Area Goals

The goals for Klamath Wildlife Area are:

Goal 1: Protect, enhance and manage upland habitats to benefit a wide variety of wildlife species, with emphasis on reducing depredation on adjacent agricultural lands by spring migrating geese.

Goal 2: Protect, enhance and manage wetland habitats to benefit fish and wildlife species.

Goal 3: Provide a variety of wildlife oriented recreational and educational opportunities to the public that are compatible with Goals 1 and 2.

Specific objectives and strategies to implement each goal, as well as detailed rationale are provided on pages 40 to 56.

Implementation Approach

Wetland habitats on KWA occur in both managed and unmanaged units. Managed wetland units are usually bordered by dikes with water control structures. Wildlife use of KWA wetlands depends on both natural, and numerous man-made semi-natural habitats.

Upland habitats on KWA are also both managed and unmanaged. Managed upland habitats consist of developed agricultural lands, utilized primarily for cereal grain and spring green forage production. Other upland habitat priorities are to manage historic

salt desert scrub and sagebrush steppe habitat and protect endangered plant sites, and nest trees for bald eagles consistent with guidance provided in the Oregon Conservation Strategy (OCS).

Primary actions benefiting wildlife on KWA are to manage or preserve the range of habitat types that historically occurred around the Klamath Basin Area. These habitats were created and maintained by a suite of ecological processes; most importantly hydrology and fire. Management activities such as water level management (drawdowns and flooding) and vegetation manipulations (controlled burning, disking, farming, grazing, mowing) are tools KWA staff uses to maintain important ecological processes needed to create healthy habitats.

Benefits to wildlife from habitat management on KWA vary between species. Not all species or guilds (group of species with similar habitat requirements) will see benefits at all times. In addition, recreational opportunities on KWA will also vary through time. Specific recreational uses when balanced with resource needs, will not be maximized in all cases.

Priority habitat related strategies on the Klamath Wildlife Area include:

- Maintenance and enhancement of spring green forage for migrating geese,
- Reduction of large emergent vegetation encroachment into wetland units reducing wildlife usage, and,
- Reduction of invasive vegetation species consistent with the OCS.

The natural ecosystem of the Klamath Basin has been irreversibly altered since arrival of European settlers in the late 1800s. Most noticeable changes have been a major disruption of hydrology in the basin as well as a proliferation of invasive species. Hydrologic changes have had a profound effect on vegetative components of wetland habitats on KWA that in turn influences wildlife and recreational use.

Current management direction is to provide specific habitat types or features on KWA in an attempt to meet life-history needs of specific wildlife species or guilds.

Introduction

Purpose of the Plan

This document is a plan designed to guide management of KWA for the next 10 years. The Oregon Department of Fish and Wildlife's (Department) management planning process for Wildlife Areas (WAs) involves development of broad goals, and formulation of specific objectives and management strategies to achieve those goals. Purposes of this plan are:

- To provide clear direction for management of KWA;
- To provide long-term continuity in Wildlife Area management;
- To communicate the Department's management priorities for KWA to its neighbors, visitors, and the public;
- To ensure management programs on KWA are consistent with the original mandate and purpose of the area when first established;
- To ensure management of KWA is consistent with Federal, State, and local natural resource plans;
- To ensure that management activities address conservation priorities and recommendations described in the OCS, and;
- To provide a basis for budget requests to support the KWA needs for staffing, operations, maintenance, and capital improvements.

Oregon Department of Fish and Wildlife Mission and Authority

The mission of the Department is to protect and enhance Oregon's fish and wildlife and their habitats for use and enjoyment by present and future generations. Oregon Department of Fish and Wildlife is the only state agency charged exclusively with protecting Oregon's fish and wildlife resources. The state Wildlife Policy (ORS 496.012) and Food Fish Management Policy (ORS 506.109) are the primary statutes that govern management of fish and wildlife resources.

Purpose and Need of Klamath Wildlife Area

KWA was established in 1958, with primary objectives of protecting and improving waterfowl habitat, and providing a public hunting area. Following droughts in the 1930s that affected most of North America, major conservation efforts both private and governmental were enacted to reverse trends of degraded and disappearing wetlands throughout the continent. During this time period there was a major creation and expansion of Federal refuges and State wildlife areas. As the concept of Flyway Management was endorsed and developed, wildlife areas were acquired and managed as part of a larger national plan focused on migratory waterfowl needs. KWA was one of several wetland-focused wildlife areas established in Oregon. The Federal Aid to Wildlife Restoration Act of 1937 (Pittman-Robertson Act or PR) was the major funding source used for acquisition of lands. This funding provided for initial development of KWA's infrastructure and continues as the sole source for operations and maintenance activities.

The Klamath Basin is an important wintering and staging area for waterfowl in the Pacific Flyway. Recent counts indicate use peaks of seven hundred fifty thousand birds in the spring and one million birds in the fall. Extensive food and resting areas are needed to support these populations and prevent depredation to private agriculture. As spring migrating geese increase in numbers and duration in the Klamath Basin, green forage resources become more important to maintain these birds on KWA and off adjacent basin agricultural lands.

The importance of KWA to migrating waterfowl has been widely recognized since its inception. Waterfowl production as well as breeding and migration habitat for other waterbirds has increased in importance on KWA during the past two decades. Many populations of wetland dependent bird species have declined precipitously throughout the West as a result of continued wetland loss and degradation.

Since the 1980s an increased demand for non-consumptive activities (wildlife viewing, photography, hiking, etc.) has occurred. This comprehensive plan acknowledges shifts in demands and management emphasis over the time on KWA. The plan also recognizes the need to provide continued opportunities for the hunting public which remains the predominant funding source for development and management actions on KWA.

The OCS, revised in 2016, is the State's overarching strategy for conserving fish and wildlife to help ensure that Oregon's natural treasures are passed on to future generations. Parts of the KWA are specifically described in the OCS as an Ecoregion Conservation Opportunity Area (COA - 138 Upper Klamath Lake Area) and contains key habitats such as aquatic, riparian, and wetland habitats. Many habitat management activities occurring at KWA address conservation actions recommended in the OCS and these will be identified throughout this management plan.

Statutory direction contained in the State Wildlife Policy provides the purpose and need for the department's actions and efforts on KWA. Background information, objectives, strategies, rationale and monitoring to meet and measure progress toward goals is provided in this document. The diversity of habitats and management strategies used in the past on KWA have contributed to a biologically diverse association of wildlife which includes at least 209 species of birds, 41 species of mammals, 20 species of fish and 14 species of reptiles and amphibians.

Klamath Wildlife Area Vision Statement

The vision for KWA is as follows:

Protect and enhance habitat for all endemic wildlife using sound stewardship measures, provide wildlife resources for use and enjoyment by present and future generations while reducing waterfowl depredation on adjacent private lands.

Wildlife Area Goals and Objectives

Wildlife area goals are broad, open-ended statements of desired future conditions that convey a purpose but do not define measurable units. In contrast, objectives are more concise statements of what the Department wants to achieve, how much the Department wants to achieve, when and where to achieve it, and who will be responsible for the work. Objectives derive from goals and provide the basis for determining strategies, monitoring wildlife area accomplishments, and evaluating the success of strategies.

The goals and objectives for KWA are:

Goal 1: To protect, enhance and manage upland habitats to benefit a wide variety of wildlife species, with emphasis on reducing depredation on adjacent agricultural lands by spring migrating geese.

Objective 1.1: Manage approximately 580 acres of agricultural upland habitat with emphasis on spring green forage.

Objective 1.2: Manage approximately 452 acres of sagebrush steppe habitat with grass and forb components consisting of 25 percent of the area with the remainder consisting of an open shrub layer of sagebrushand/or greasewood.

Objective 1.3: Maintain and protect approximately 20 acres of upland habitat where federally listed Applegate's milk-vetch (*Astragalus applegatei*) occurs. This habitat is characterized by seasonally moist, strongly alkaline soils dominated by greasewood with sparse, native bunch grasses and patches of bare soil.

Objective 1.4: Protect approximately 100 acres of upland forest habitat, characterized by large Ponderosa pine, a habitat used by nesting and wintering bald eagles.

Objective 1.5: Maintain and improve wildlife area facilities, structures, and equipment used to conduct habitat management and public use projects.

Goal 2: To protect, enhance and manage wetland habitats to benefit fish and wildlife species.

Objective 2.1: Manage approximately 185 acres of palustrine semi-permanently flooded wetlands on Miller Island Unit, with a ratio no greater than 3:1 of robust emergent vegetation (dominated by cattails and bulrushes) to open water. These wetlands should have open water and interspersed stands of vegetation to create a mosaic of features within individual habitat management units. Water depths will generally not exceed 24 inches and open water areas will support rooted submerged aquatic plants in most locations.

Objective 2.2: Manage approximately 792 acres of palustrine seasonally flooded wetlands with a minimum plant coverage of 80 percent.

Objective 2.3: Enhance, manage and protect approximately 278 acres of palustrine intermittently flooded wetlands (alkali flats).

Objective 2.4: Maintain approximately 583 acres of lacustrine permanently flooded wetland habitats on Shoalwater Bay and Sesti Tgawaals Point units. Emphasis will be on maintaining productive stands of submerged aquatic vegetation such as sago pondweed.

Objective 2.5: Protect and enhance approximately 155 acres of riverine wetlands on Gorr Island Unit with a ratio of robust emergent vegetation (dominated by cattails and bulrushes) to open water of no greater than 3:1. These wetlands should have open water with interspersed stands of vegetation to create a mosaic of habitat features within the unit. Water depths will be dependent on the existing depth of the Klamath River.

Objective 2.6: Maintain and improve critical physical and functional infrastructure affecting wetland management activities.

Goal 3: To provide a variety of wildlife oriented recreational and educational opportunities to the public that are compatible with Goals 1 and 2.

Objective 3.1: Provide hunting, trapping, and angling opportunities in a manner compatible with habitat management objectives.

Objective 3.2: Provide wildlife viewing and education/interpretation opportunities compatible with Objective 3.1.

Wildlife Area Establishment

In the late 1800s, the Klamath Basin was covered by about 185,000 acres of shallow lakes and extensive marshes. These lakes and marshes, with their rich soils and abundant food, attracted peak fall concentrations of over six million waterfowl, provided vital nesting and brood-rearing habitat, and supported large concentrations of marsh birds such as pelicans, cormorants, egrets, and herons.

Water was first diverted for agricultural irrigation purposes in 1882, and by 1883 about 13,000 acres of farmland were being irrigated by private agriculturalists. In that year, the U.S. Bureau of Reclamation investigated the feasibility of developing a federal irrigation project. The first withdrawal of land by the Secretary of the Interior occurred in 1904. The federal Klamath Reclamation Project was authorized on May 1, 1905, and called for the eventual irrigation of 235,400 acres. Construction on the project began in 1906, and water was first made available for irrigation on May 22, 1907. This initial construction was followed by the completion of the Clear Lake Storage Dam in California in 1910 and the Lost River Diversion Dam in Oregon in 1912.

As a result of the controversy over draining wetlands to create agricultural lands, thereby destroying waterfowl habitat, on August 8, 1908 President Theodore Roosevelt set aside the “Klamath Lake Reservation” as the nation’s first waterfowl refuge (Executive Order Number 924). In 1958, the state of Oregon established the “Furber Marsh Management Area”.

Land purchases leading up to the development of the KWA began in 1951 with the purchase of approximately 1,241 acres of Shoalwater Bay. The conditions of this purchase required that 50% of the landbase be put into a refuge (sanctuary). In 1952, 635 acres of this purchase was deeded over to the Klamath County Parks Department for the development of the Eagle Ridge County Park. These lands are posted and closed to hunting.

Numerous amendments of the Pittman-Robertson Act grant include the consolidation of acreages into the “Furber Marsh Management Area” in 1958, and the renaming of the landbase to KWA in 1977.

Of the original 185,000 acres of wetlands in the Klamath Basin, less than 36,000 acres exist today.

The Federal refuge system has grown to include five satellite refuges in the Klamath Basin, the combination of which are significantly larger than KWA. The acquisition and development of KWA is supplemental to the federal program.

KWA was purchased with federal Pittman-Robertson funds to establish and improve wildlife habitat, particularly for waterfowl, to re-establish wetlands in Shoalwater Bay and to provide public recreational opportunity associated with utilization by wildlife. Since the initial acquisitions (see **Appendix A**), extensive developments have been implemented to provide for wildlife needs while also reducing depredation of private agricultural lands.

KWA is comprised of four main, geographically separated units which are listed below.

Miller Island	2,464.6 acres
Shoalwater Bay	605.8 acres
Sesti Tgawaals Point	180.5 acres
Gorr Island	161.5 acres
Total	**3,412.4 acres**

Miller Island Unit is further divided into 13 managed subunits, all of which will be described later in this plan.

Description and Environment

Physical Resources

Location

KWA is located in south-central Oregon, in Klamath County. The Miller Island portion ofthe Area is adjacent to State Highway 97, six miles southwest of Klamath Falls. Outlying units of KWA are dispersed along the west bank of Upper Klamath Lake as well as ten miles downriver from Klamath Falls.

The wildlife area consists of four disjunct parcels, which are divided into 16 Habitat Management Units (HMUs). (See **Appendix G** for detailed Habitat Management Unit descriptions). Headquarters for the wildlife area is located at 1850 Miller Island Road, six miles south and west of the city of Klamath Falls. **Figure 1** shows the location and key features of KWA.

Climate

The climate is characterized by dry summers and moderately wet winters. Average summer temperature is 66^{o}F and average winter temperature is 34^{o}F. Extreme summer temperatures of 100^{o}F and extreme winter temperatures of -15^{o}F will sometimes occur. The length of the frost-free growing season varies from 90 to 140 days with the threat of a killing frost occurring any month of the year.

Precipitation in the Klamath Basin averages 13 inches annually, with open pan evaporation loss averaging 48 inches (USGS, 2006). Such weather extremes play an important role in water management at KWA.

Topography and Soils

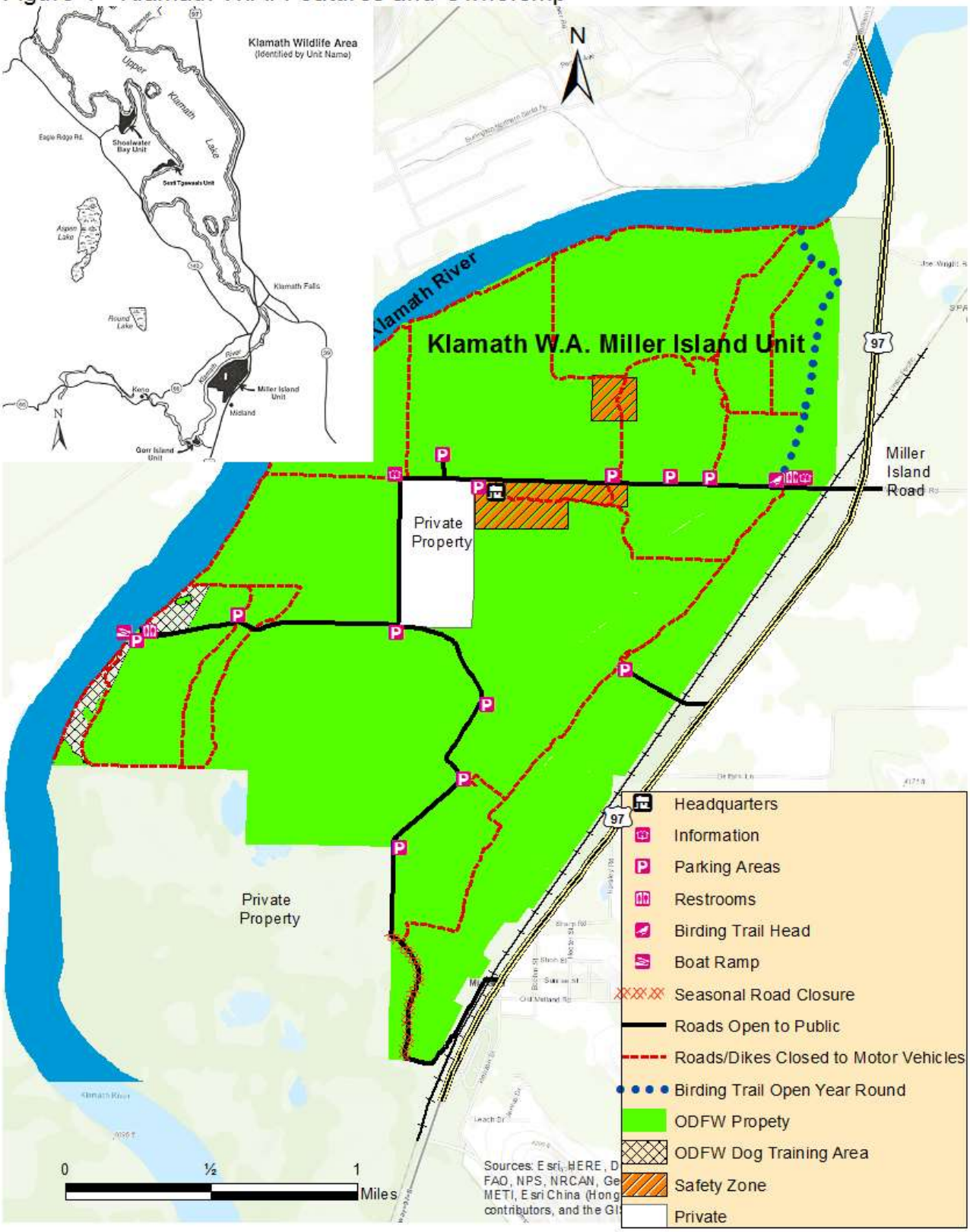
The KWA's four geographically separate units stretch over 23 air miles, from southernmost Gorr Island Unit located in the Klamath River to the northernmost Shoalwater Bay Unit located on the west bank of Upper Klamath Lake. Elevation on the wildlife area ranges from 4,282 feet above sea level at Sesti Tgawaals Point to 4,080 feet above sea level at Gorr Island Unit.

Much of KWA land base is below the average water level of either Upper Klamath Lake (Shoalwater Bay Unit and Sesti Tgawaals Unit) or Klamath River (Miller Island Unit and Gorr Island Unit). Interior water levels are regulated by a perimeter dike on the Miller Island Unit.

Miller Island Unit

The elevation of Miller Island Unit is 4,100 feet. Soils range from medium acid Xerofluvent to very strongly alkaline Laki, Henley, and Malin series. Structure and texture of soils allow for rapid permeability in Xerofluvent series to slow permeability in the Laki, Henley, and Calimus soil series.

Figure 1 - Klamath W.A. Features and Ownership



Soil Capability classes range from class II soils, which have moderate limitations that reduce choices of plants or require moderate conservation practices, to class VII soils which have very severe limitations that make them unsuited for cultivation and restrict their use largely to pasture, range, woodlots, or wildlife uses.

Cemented hardpan is present throughout the project area, appearing at depths of 20 inches down to 60 inches. The water table is present from the surface downward.

Approximately half of the unit is comprised of some type of wetlands and the other half is comprised of uplands.

Shoalwater Bay Unit

The elevation of Shoalwater Bay Unit is 4,143 feet at full pool.

Approximately two-thirds of Shoalwater Bay is deep-water marsh with remaining one-third composed of raised hillocks heavily matted with hardstem bulrush. Generally, during spring months, the raised hillocks are covered by water, eliminating all waterfowl nesting activity except for over water nesters. During summer months, as lake water levels drop, these flooded hillocks are exposed, providing resting, loafing and feeding areas for local and migratory waterbirds.

Shoalwater Bay Unit also includes a small upland acreage vegetated by ponderosa pine and small shrubs. The majority of this acreage is composed of Woodcock-Nuss-Royst soils which are shallow to very deeply formed in colluvium with material weathered from andesite, basalt, tuff, and ash.

Flood soils of Shoalwater Bay are called ponded histosols. When dry, these soils take on the characteristics of lather muck, which are rated as class IV soils. Lather muck soils have formed in very deep deposits of partly decomposed fibrous organic material that have one or more thin layers of diatomaceous silt. This peat extends to a depth of 70 inches and is medium acid to neutral in the upper 15 inches and strongly acid to slightly acid in the lower depths.

Sesti Tgawaals Point Unit

The elevation of this unit ranges from 4,143 feet (marsh at full pool) to 4,282 feet (a 71 acre upland parcel).

Approximately 10% of Sesti Tgawaals Point marsh is open water with the remaining 90% composed of rank bulrush and cattail stands. Generally, during spring months, bulrush-cattail stands are inundated by water, eliminating all nesting activity, except for over water nesters. During late summer and fall months when the lake level drops, limited feeding, resting and loafing areas are provided on rank vegetative mats.

Flooded soils of Sesti Tgawaals Point Unit are called ponded histosols and when dry take on the characteristics of lather muck, which are rated as class IV soils.

The 77 acre upland component of Sesti Tgawaals Point Unit is composed of Lorella-Calimus associated soils on its southwest facing slope and Woodcock-Rock outcrop complex on its northeast facing slope. Vegetation is primarily composed of Ponderosa Pine and other mixed conifers with aspen located in the riparian area.

The Lorella series make up 60% of the Lorella-Calimus soil, forming from very cobbly and gravelly material weathered from tuff and basalt. The other 40% consists of Calimus series and is formed from loamy lacustrine sediment. Surface depths average 5 (Lorella) to 14 (Calimus) inches with substratum reaching depths of 19 (Lorella) inches to 60 (Calimus) inches. Slopes range from 15 to 35%.

Woodcock-Rock outcrop complex soils formed in extremely gravelly colluvium weathered from andesite, basalt, and a small amount of cinders and ash. Surface depths average 10 inches with substratum reaching depths of 60 inches. Slopes range from 40 to 70%.

Gorr Island Unit

This unit consists of two parcels, an upland component, at an elevation of 4,087 feet dropping down to an open water component at approximately 4,080 feet above sea level.

Approximately 25 acres located along Gorr Island's west half consist of uplands to slightly inundated wetlands. The remaining acreage consists of rank vegetative stands of rushes. The other parcel to the northeast consists of open water (20%) with the remaining 80% consisting of rank bulrush stands. During warm months of the year water levels fluctuate as much as eight inches weekly along this stretch of the river.

The soils on the west half of Gorr Island consist of Calimus loam with the remaining soils throughout the unit consisting of Tulana silt loam. Core samples taken in 1978 indicate that most of the Tulana silt loam consists of a peat layer 1/2 foot to 1-1/2 feet thick, overlaying a diatomaceous material plus or minus 10 feet thick, which overlays an unstable sand layer.

Calimus loam soils formed in alluvial and lacustrine sediment weathered mainly from diatomite, tuff, and basalt.

Typically, the surface layer is about 14 inches thick, with the subsoil extending to a depth of 60 inches. Soil suitability classification is II.

Tulana silt loam soils formed in sediment consisting mainly of diatoms, sponge spicules, ash, and related material. The surface layer is typically 23 inches thick, followed by a muck silt mid-layer to 58 inches, with a sandy silt loam bottom layer to 92 inches. Soil suitability classification is III.

Habitat Types
A majority of the Miller Island Unit consists of a very shallow, managed alkaline and freshwater marsh below Klamath River level. Water depths in the marsh and ponds in all units rarely exceed 24 inches except in Shoalwater Bay Unit, large lakes or ponds, water transportation canals, and borrow pits along dikes.

Upland habitat on Miller Island Unit is characterized by a combination of sagebrush steppe, salt desert scrub (dominated by black greasewood (*Sarcobatus vermiculatus*), green rabbitbrush (*Ericameria teretifolia*), big sagebrush (*Artemisia tridentata*), and other alkaline adapted shrubs, forbs, and grasses) and converted upland perennial grass communities (dominated by tall wheatgrass (*Thinopyrum ponticum*) and Great basin wild rye (*Leymus cinereus*)).

Due to Department management actions and other influences outside of the wildlife area, KWA habitats are in a continual state of change. Acreage of specific habitat types on KWA varies over time, both between and within years.

There are seven broad habitat types found within the borders of KWA. Lacustrine and palustrine wetlands are delineated into additional sub-types based on hydrology. These habitat types are shown in **Figure 2.1** and **Figure 2.2**. Wetlands are considered Key Habitats within the East Cascades Ecoregion, as defined in the OCS. The OCS recommends conservation actions such as improving water delivery systems and maintaining diverse wetland types, both of which are high priority activities occurring on KWA. **Table 1** shows the number of acres of each habitat type occurring on KWA.

Table 1. Habitat composition on the Klamath Wildlife Area.

Habitat Type	Approximate Acres
Lacustrine wetlands (lakebed and alkali playas)	
Open water (lakebed)	583
Intermittently flooded	108
Total	**691**
Palustrine wetlands	
Intermittently exposed	70
Semi-permanently flooded	421
Seasonally flooded	725
Total	**1216**
Riverine wetlands	**155**
Salt desert scrub and sagebrush steppe uplands	**406**
Upland perennial grass	**245**
Ponderosa pine forest	**100**

Agricultural uplands	
Cereal grains	192
Alfalfa	68
Improved pasture	317
Tree and shrub plantings	8
Total	**585**
Disturbed areas (Roads, houses, parking areas)	**14**
Total KWA Acres	**3,412**

Habitat types found on KWA are described in greater detail below. Plant species found on KWA are listed in **Appendix B**.

I. Wetlands

Description of wetland habitat types follows the classification scheme of Cowardin et al. (1979). A majority of KWA is freshwater palustrine (marsh) emergent, aquatic bed and lacustrine (pertaining to lakes or lake shores) aquatic bed wetlands. Frequently, emergent and aquatic bed plant communities create a mosaic of wetland plant types within each management unit.

Within each major wetland type, variation in hydrology and topography creates important differences in plant communities and seasonal differences in wetland availability that in turn influences bird use. Consequently, additional habitat descriptions are provided based on hydrology modifiers defined by Cowardin et al. (1979). While these habitat associations are described below as discrete, they represent a continuum from dry to wet and when considering topographical variation on KWA, each may occur in close juxtaposition to others in a single habitat management unit.

IA. Palustrine wetlands

1. Intermittently exposed: Surface water persists throughout the growing season in most years except in years of extreme drought. The wetlands are typically deep open water dominated by rooted aquatic vascular plants such as sago (*Stuckenia pectinata*), water butter-cup (*Ranunculus aquatilis*) and water milfoil (*Myriophyllum* spp.) and bordered by tall emergent plants such as American three-square (*Scirpus americanus*), hardstem bulrush (*Scirpus acutus*), river bulrush (*Scirpus olenyi*), softstem bulrush (*Scirpus validus*) and broad and narrow-leafed cattail (*Typha latifolia* and *Typha anguistifolia*, Baltic and other rushes (*Juncus* spp.), and various sedges (*Carex* spp.). Water depths range from 2-3 inches to 2-3 feet. Forage fish (primarily fathead minnow (*Pimpephales promelasare*)) are abundant.

2. Semi-permanently flooded: Surface water is actively managed by the department to persist throughout the growing season in most years. These wetlands are dominated by emergent plants such as bulrushes, alkali, American three-square, hardstem, river, and softstem), and broad and narrow-leafed cattail, seaside arrow grass (*Triglochin maritime*), Baltic and other rushes (*Juncus* spp.), and various sedges. Water depths range from 2-3 inches to 2-3 feet. Usually this habitat is rich in submerged aquatic plant growth harboring abundant and diverse invertebrate communities. Forage fish (fathead minnow) are abundant. These sites vary in productivity, capability and wildlife use depending on the depth and permanency of water levels.

This habitat type provides foraging sites for a diverse array of wetland-dependent and wetland-obligate wildlife species, both migrants and residents. A large number of bird species will use these wetlands as breeding, brood rearing and molting habitat.

Tall statured emergent vegetation within this community has expanded dramatically in recent years, taking advantage of low and receding water levels that allow for seedling development on exposed mudflats or rhizome growth of individual clones. Associated open water areas and use by some species of wildlife have been reduced as a consequence of this emergent vegetation expansion.

3. Seasonally flooded: Surface water is present for extended periods, fall through winter, and especially early in the growing season. As summer progresses, with increases in evapotranspiration and reduced water deliveries due to irrigation season diversions, these wetlands will dry. Saltgrass (*Distichlis spicata*), spikerushes (*Eleocharis* spp.), alkali grass (*Puccinella* spp.), foxtail barley (*Hordeum jubatum*), suaeda (*Suaeda calceoliformis*) and a wide variety of other grasses, sedges, rushes and forbs are common. Sometimes medium statured emergents (American three-square bulrush and arrowgrass) are found in this wetland type. These sites vary in productivity, capability and wildlife use depending on water depth, timing and rate of receding water levels as well as amounts of vegetation present. Within this habitat type there are sometimes extensive areas of mud flats with little or no vegetation. Mud flats are sometimes intermittently inundated with water, as levels fluctuate due to management actions or wind. This habitat supports abundant invertebrate populations, providing food to a wide variety of wildlife species.

Figure 2.1 Klamath Wildlife Area Miller Island Unit Habitat

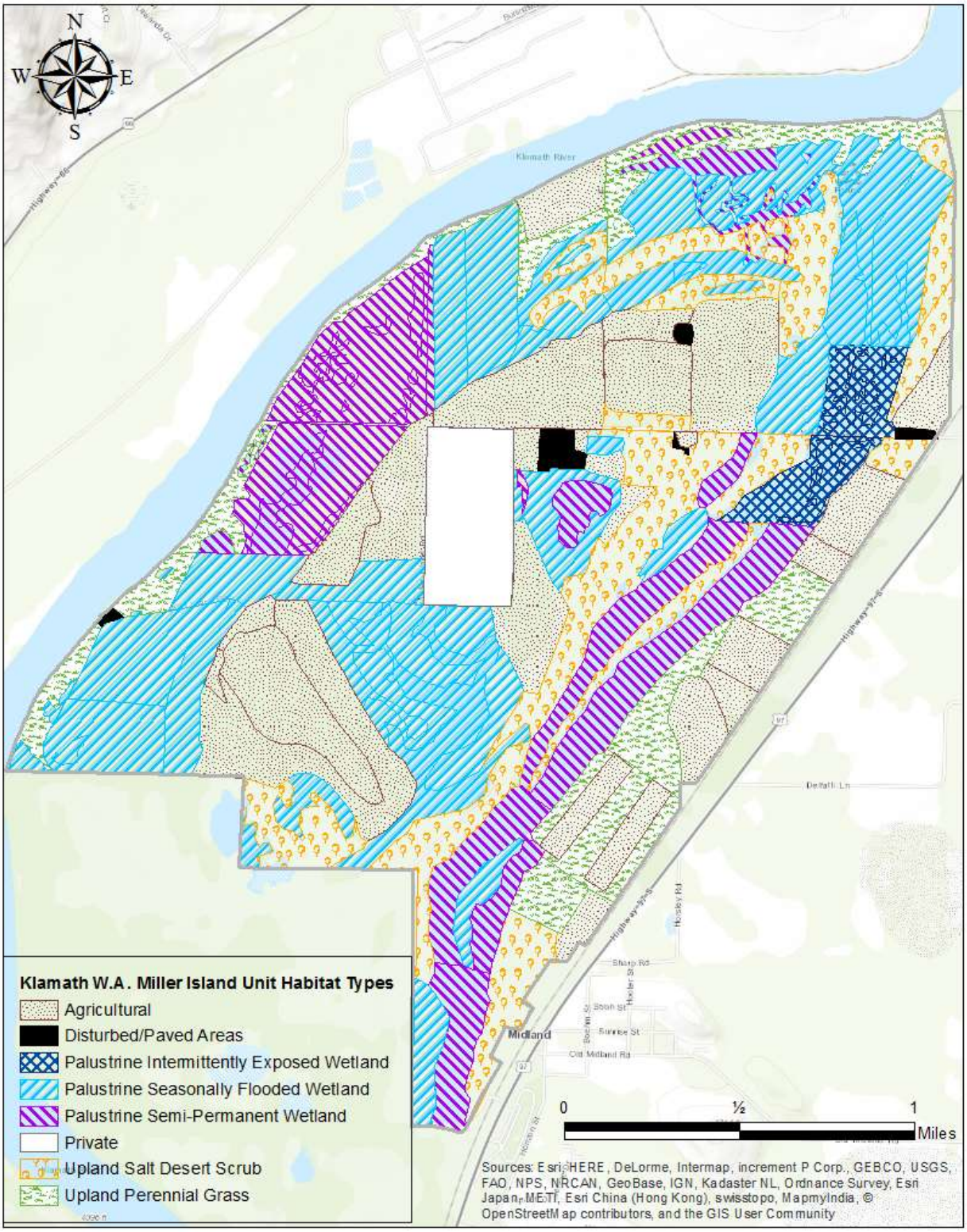
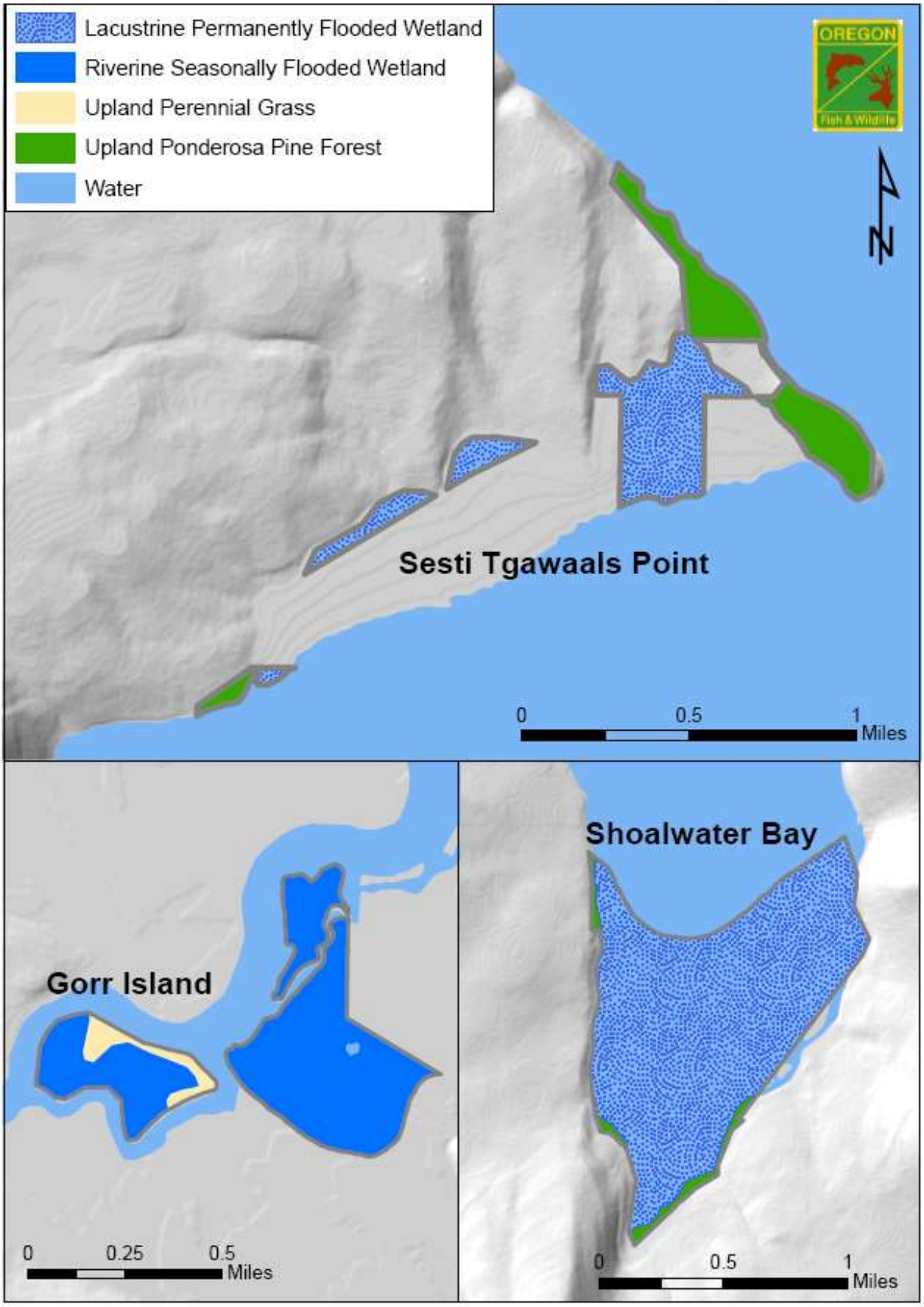


Figure 2.2 - Klamath Wildlife Area Habitat and Remote Habitat Management Units



IB. Lacustrine wetlands (Open water/Lakebed and freshwater flats)

1. Aquatic bed: These wetlands include the lakebed of Upper Klamath Lake proper. The unconsolidated mud bottom sometimes supports emergent and submergent aquatic plants where freshwater influences permit plant growth. In these areas there is significant foraging by waterbirds on vegetation and associated invertebrates. In dry years, the lake can recede to very low levels and significant portions of this habitat become dry. At varying lake levels and during extreme weather events (e.g. heavy precipitation and strong winds) considerable portions of the aquatic bed become intermittently or seasonally flooded. Invertebrates can be abundant in this habitat. The relatively shallow water depth and unconsolidated mud bottom are frequently affected by strong winds causing considerable turbidity. Turbidity reduces algae and phytoplankton productivity by blocking sunlight and disrupting photosynthesis. This in turn affects the productivity of macro invertebrates. Isolation, open water and shallow depth provide secure and disturbance-free roosting and loafing sites for a wide variety of waterbirds.

2. Intermittently flooded (depicted collectively with Open Water – Lakebed and freshwater flats): These wetlands are dry most of the year, are dependent on the level of Upper Klamath Lake, and have a shallow water table. Most of this habitat is characterized by large emergent plants such as bulrushes, cattails, seaside arrow grass, Baltic and other rushes, and various sedges. Water depths range from 2-3 inches to 2-3 feet.

IC. Riverine wetlands

These wetlands are dominated by emergent plants such as bulrushes, cattails, seaside arrow grass, Baltic and other rushes, and various sedges. Water depths range from 2-3 inches to 2-3 feet and are dependent on the water level of adjacent Klamath River. Usually this habitat is rich in submerged aquatic plant growth harboring abundant and diverse invertebrate communities. Forage fish (primarily fathead minnow and gold fish (*Carassius aruatus*)) are sometimes abundant. These sites vary in productivity, capability and wildlife use depending on the depth and permanency of water levels.

This habitat type provides foraging sites for a diverse array of wetland-dependent and wetland-obligate wildlife species, both migrants and residents. A large number of bird species will use these wetlands for breeding, brood rearing and molting.

Tall stature emergent vegetation within this community has expanded dramatically in recent years, taking advantage of low and receding water levels that allow for seedling development on exposed mudflats or rhizome growth of individual clones. Associated open water areas and use by some species of wildlife have been reduced as a consequence of the expansion of this emergent vegetation.

II. Uplands

IIA. Salt desert scrub

This habitat type is the most extensive upland and occurs throughout the wildlife area, sometimes interspersed in and surrounded by large wetlands areas. Black greasewood, rabbitbrush and spiny hopsage (*Atriplex spinosa*) are common shrubs found on nearly all sites. Basin big sagebrush (*Artimesia tridentate*) occurs in more favorable soil locations. Trees are exceptionally rare, consisting of planted cottonwoods (*Populus trichocarpa*), willows (*Salix* spp.) and other species around former homestead sites. Introduced shrubs have been planted and cultivated around homestead sites to enhance cover and food production for wildlife. Saltgrass, perennial ryegrass (*Lolium perenne*), basin wildrye (*Elymus cinereus*), a wide variety of introduced and native grasses, as well as a diverse array of forbs occur as understory ground cover. Soils are moderately to severely alkaline and silty in structure.

IIB. Upland perennial grass

1. Modified upland perennial grass: Features that were created by human disturbance through the creation of levees, spoil piles from dredgings and spoils/berms from wetland maintenance. These man made uplands are dominated by non-native perennial grasses such as tall wheat grass and reed canary grass (*Phalaris arundinacea*).

2. Altered upland perennial grass: Salt desert scurb and sagebrush steppe habitat were developed to perennial grass uplands starting in the late 18th century for cattle feed and more was later developed in the 1970s and 1980s through mowing, grazing and burning to enhance upland nesting for waterfowl, it also provides an opportunity for upland game bird nesting and hunting. Primarily tall wheatgrass (*Thinopyrum ponticum*), sweet clover (*Melilotis officinalis*) and Great Basin wild rye (*Leymus cimereus*) were planted.

IID. Agriculture:

Several upland areas were cleared, leveled and extensively farmed by homestead ranches prior to department acquisition. Irrigation and soil amendments modified harsh growing conditions and grain and hay crops were produced. Flood and sprinkler irrigation systems remain and are utilized to produce wildlife food and cover crops in several locations.

1. Cereal grains: Small cereal grains such as barley (*Hordeum vulgare*), triticale (*Triticosecale rimpaui*) and wheat (*Triticum aestium*) are currently farmed on an annual basis.

2. Alfalfa (*Medicago sativa*): Managed as spring green forage for spring migratory geese.
3. Improved pasture: Managed as spring green forage for spring migratory geese, but is also heavily utilized by raptors, Sandhill cranes and some species of shorebirds during flood irrigation.

4. Tree and shrub plantings: Introduced deciduous tree and shrub species have been planted in plots throughout the agricultural uplands to provide food and cover for many species of wildlife. Species diversity is enhanced because of the variety of habitat features provided by these plantings.

Description of Management Units

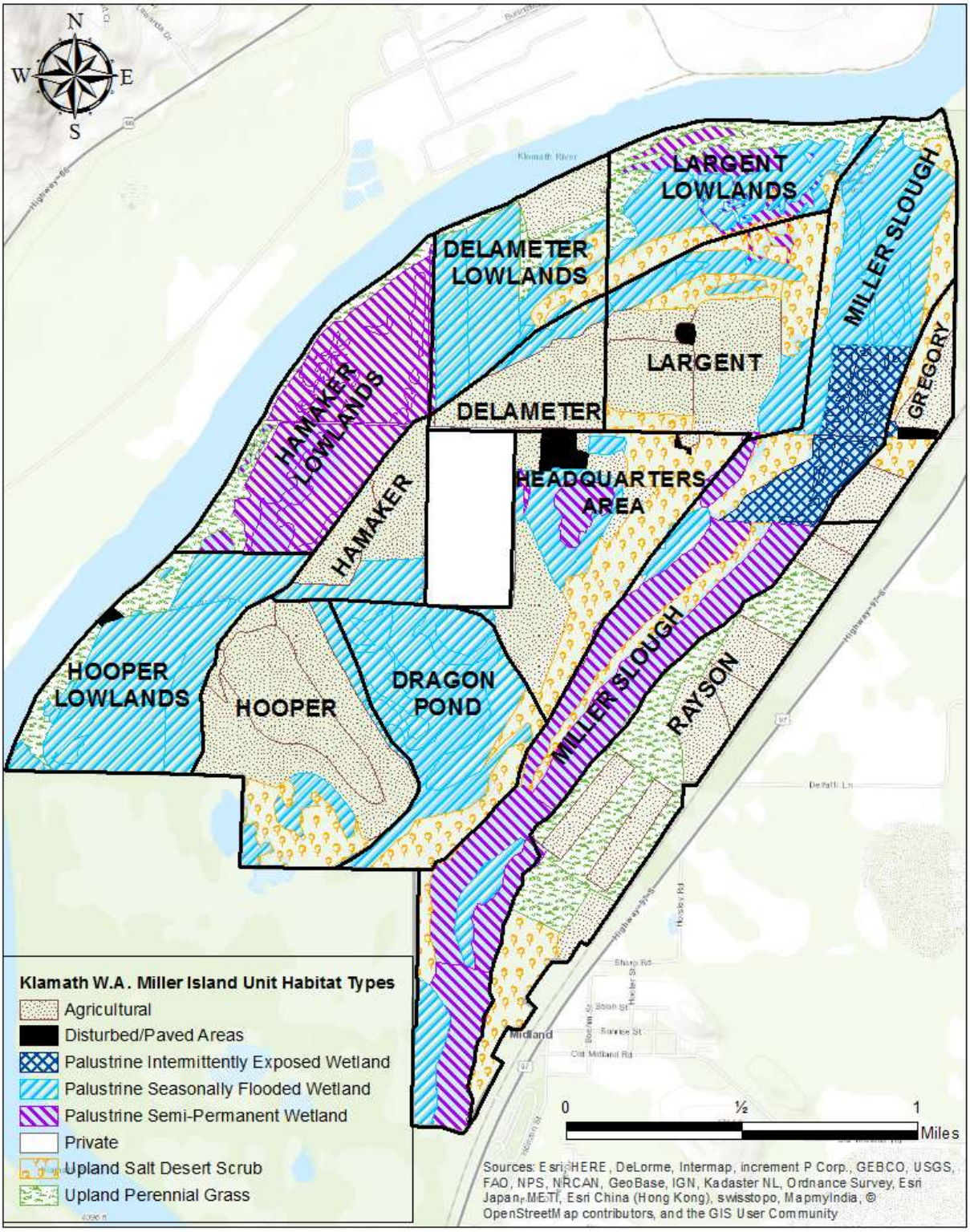
KWA consists of sixteen habitat management units (HMUs). These units have been delineated based on historic uses, physical features or boundaries, vegetation types, current or past management activities and water sources. **Figure 4** shows locations of HMUs on Miller Island and **Appendix G** describes these management units in further detail.

Wetlands on Miller Island Unit are primarily fed by the Klamath River which has a current year-round flow of 1,000 cubic feet per second (cfs).

The Klamath River associated with Miller Island and Gorr Island units is regulated by the Keno dam with river levels varying little during the year.

Water levels at Sesti Tgawaals Point and Shoalwater Bay units are dictated by Upper Klamath Lake levels. Water levels in Upper Klamath Lake can vary up to three feet per year or more.

Figure 4 - Klamath W.A. Miller Island HMUs and Habitat Types



Biological Resources

Wetland dependent or wetland obligate wildlife, primarily birds, is the major wildlife resource on KWA. Over 209 species of birds have been recorded on KWA, and over 57 species are confirmed breeders. Comprehensive inventory data for mammal, amphibian and reptile (herptile) species on KWA is lacking, but it is estimated that at least 43 mammal and 14 herptile species may be present. Occurrence and abundance of invertebrates is unknown. However invertebrates are a significant forage resource for KWA fish and wildlife. See **Appendix C** for a list of wildlife species.

Birds

Birds are the most important and dominant component of wildlife at KWA in terms of abundance and species diversity. Waterfowl and shorebirds are major species complexes utilizing KWA. Breeding season use by these birds has expanded dramatically over the past thirty years in response to wetland habitat management activities. Timing and abundance of migrant waterfowl and waterbirds using KWA has changed over time, but remains significant and of critical importance to the Pacific Flyway. Habitat management activities have focused on wildlife diversity and essentially all species utilizing KWA have benefited. KWA plays an important and balanced role in meeting life-cycle needs for a wide variety of species that cannot be met on surrounding developed lands in the basin.

Waterfowl

KWA has significant breeding populations of ducks (twelve species represented) and Canada geese (*Branta canadensis*) that are important to Pacific Flyway waterfowl populations. Populations nesting on KWA are estimated at:

- Western Canada goose *(Branta canadensis)* 200 -300 pairs
- Mallard (*Anas platyrynchos*) 1000-1500 pairs
- Cinnamon teal (*Anas cyanoptera*) 300-500 pairs
- Gadwall (*Anas streptera*) 500-1000 pairs
- Wood duck *(Aix sponsa)* 50-100 pairs
- Redhead *(Aytha americana)* 50-100 pairs
- Canvasback *(Aytha valisneria)* 50-100 pairs

These breeding species, supported by the diverse habitats of Klamath Wildlife area, contribute to the continental waterfowl population goals set in the North American Waterfowl Management Plan and support conservation efforts under the Intermountain West Joint Venture. Recoveries and recaptures of ducks and Canada geese banded at KWA over the last few years reveal a contribution to harvest in a variety of Pacific Flyway states and Canadian provinces. KWA is more importantly a major migration stopover for waterfowl in the Pacific Flyway. KWA sees about 2 million waterfowl use days (WUDs) in the spring. This is comprised mostly of spring migrating geese (1.5 million WUDs) from a combination of Ross's (*Chen rossii*), Pacific greater white-fronted (*Anser albifrons frontalis*) and Lesser snow geese (*Checn caerulescens*). Tundra swan (*Cygnus columbianus*) use typically only occurs in the spring with about 100,000 WUDs

and duck species making up about 500,000 WUD. Waterfowl fall migration is less with about 1 million WUDs with ducks comprising most of the use days.

Shorebirds

KWA supports significant populations of breeding and migrant shorebirds. Common breeding species are estimated as follows:

- American avocet (*Recurvirostra americana)* 50 -100 pairs
- Western willet (*Catoptrophorus semi-palmatus*) 5 -10 pairs
- Black-necked stilt (*Himantopus mexicanus*) 75 -100 pairs
- Killdeer (*Chardrius vociferus*) 50 -100 pairs
- Spotted sandpiper (*Actitis macularia*) 30 - 50pairs
- Common snipe (*Galinago galinago*) 5 -10 pairs

Spring and fall migration use of KWA by shorebirds is estimated to be less than 0.5 million use days, primarily by:

- Long -billed dowitcher (*Limnodromus scolopaceus*)
- Long-billed curlew *(Numenius americanus)*
- American avocet
- Western Willet
- Black-necked stilt
- Killdeer
- Dunlin (*Calidris alpina*)
- Spotted sandpiper (*Actitis macularia*)
- Western (*Calidris mauri*) and Least (*Calidris minutilla*) sandpipers

Colonial Nesting Birds

No known waterbird nesting colonies have been recorded as of recent. A sizeable heron rookery is located on private land adjacent to Sesti Tgawaals.

KWA is however, a spring and fall migration stopover as well as a summer feeding area for a variety of colonial waterbirds including but not limited to American white pelicans (*Pelecanus erthrorhynchos*), black crowned night-herons (*Nycticorax nycticorax*), double-crested cormorants (*Phalacrocorax auritus*), great blue herons (*Ardea herodias*), great egrets (*Ardea alba*), white-faced ibis (*Plegadis chihi*), Caspian (*Sterna caspia*) and Forster's (Sterna forseri) terns, eared (*Podiceps nigricollis*) and Western (*Aechmophorus occidentalis*) grebes.

Other Waterbirds

Greater sandhill cranes (*Grus canadensis tabida*) are a regular breeding species on KWA. An estimated 6-10 pairs currently breed on KWA Miller Island Unit.

KWA provides habitat to several species of secretive marsh birds such as American coots (*Fulica americana*), and pied-billed grebes (*Podilymbus podiceps*) both of which are common breeding species on the area. Migration use is very heavy, especially by American coots. Rails (Virginia (*Rallus limnicola*) and sora (*Porzana carolina*) appear to

be very abundant throughout KWA wetlands during spring through fall months. Habitat for yellow rails (*Coturnicops noveboracensis*) probably exists on KWA, but comprehensive surveys for rails have not been conducted. American bitterns (*Botarus lentiginosus*) are common breeding species. Migration use by this species is unknown and wintering use is minor.

Raptors

KWA is home to number of breeding raptors. Common breeding species are estimated as follows:

- Red-tailed hawk (*Buteo lineatus)* 4 - 10 pairs
- Northern harriers (*Circus cyaneus*) 10 - 20 pairs
- American kestrel (*Falco sparverius*) 5 - 10 pairs
- Bald eagle (*Haliaeetus leucocephalus*) 1 pair
- Barn owl (*Tyto alba*) 2 - 4 pairs
- Great horned owl (*Bubo virginianus*) 2 - 4 pairs

Bald and golden (*Aquila chrysaetos*) eagles are a common site late winter through spring as they follow waterfowl migration. Rough-legged hawks (*Buteo lagophus*) are a common wintering species utilizing Miller Islands open pasture areas.

Passerines

Passerine species are very numerous during migration periods, utilizing wetlands as well as tree and shrub components of upland habitats found on KWA. Over thirty species are known to breed on KWA.

Upland game birds

California quail (*Callipepla californica*) are very abundant, especially in upland habitats on KWA. There are remnant breeding populations of ring-necked pheasant *(Phasianus colchicus)* that occur on Miller Island Unit, with annual augmentation of roosters every fall by birds not harvested from releases for the regulated hunt program.

Mammals

Furbearers present include bobcat (*Lynx rufus*), mink (*Mustela vison*), long-tailed weasel (*Mustela frenata*), muskrat (*Ondatra zibethicus*), beaver (*Castor canadensis*), Northern river otter (*Lontra canadensis*) and raccoon (*Procyon lotor*). Muskrat are especially numerous throughout KWA wetlands. This species provides considerable habitat benefits through vegetation clipping and house construction, but sometimes causes major problems in dikes and levees as a result of burrowing activity and den construction.

Species that commonly occur include black-tailed deer (*Odocoileus hemionus columbianus*) coyote (*Canis latrans*), striped skunk (*Mephitus mephitus*), mountain cottontail *(Sylvilagus nuttallii)*, black-tailed jackrabbit (*Lepus californicus*), yellow-bellied marmot (*Marmota flaviventris*), California ground squirrel (*Spermophilus beecheyi*), Belding's ground squirrel (*Spermophilus beldingi*), other small microtines and mice (species occurrence or abundance is unknown).

Species that are less common include western spotted skunk *(Spilogale gracilis),* and American badger *(Taxidea taxus).*

Five bat species have been confirmed on KWA including silver-haired bat (*Lasionycteris noctivagans),* California myotis (*Myotis californicus),* big brown bat (*Eptesicus fuscus),* pallid bat *(Antrozous pallidus),* and little brown myotis *(Myotis lucifugus).*

Occasionally Rocky Mountain elk *(Cervus elaphus nelsoni)* and cougar *(Puma concolor)* are known to have been present on the wildlife area but in small numbers and low frequency.

Amphibians and Reptiles

Native species of snakes, lizards and frogs are plentiful on the area, as are introduced bullfrogs (*Rana catesbeiana*). Bullfrogs (date of introduction unknown) have expanded dramatically on Miller Island Unit and are known to predate on native amphibians, reptiles, birds and fish (OCS 2006: pgs. 176, 367).

Fish

The following fish species, **Table 2**, are found on the Area. Fish species are similar on all units; however the frequency and density of populations varies due to water quality, habitat conditions, and time of year.

Table 2

Common Name	***Scientific Name***
Blue chub	*Gila coerulea*
Brown bullhead	*Ameiurus nebulosus*
Fathead minnow	*Pimephales promelas*
Gold fish	*Carassius auratus*
Klamath Lake sculpin	*Cottus princeps*
Klamath largescale sucker	*Catostomus snyderi*
Klamath River lamprey	*Lampetra spp*
Largemouth bass	*Micropterus salmoides*
Lost River sucker	*Deltistes luxatus*
Marbled sculpin	*Cottus klamathensis*
Pumpkinseed	*Lepomis gibbosus*
Redband trout	*Oncorhynchus mykiss*
Sacramento perch	*Archoplites interruptus*
Shortnose sucker	*Chasmistes brevirostris*
Slender sculpin	*Cottus tenuis*
Klamath speckled dace	*Rhinichthys osculus klamathensis*
Tui chub	*Gila bicolor*
White sturgeon	*Acipenser transmontanus*
Yellow bullhead	*Ameiurus natalis*
Yellow perch	*Perca flavescens*

Species of Conservation Concern
There are a few threatened and/or endangered species that use KWA:

- One state and federally listed endangered plant, Applegate's milk-vetch occurs on the Miller Island Unit. Currently there are three known sites.

- Listed Lost River and short-nosed suckers are known to occur in Klamath River adjacent to KWA and in Klamath Lake within and bordering Shoalwater Bay and Sesti Tgawaals Point units.

There are several species of federal or state concern that are present at least part of the year on KWA (see **Table 3**). Many of these wildlife and fish species are summer residents: Black-necked stilt, Greater sandhill crane *(*, Lewis's woodpecker (*Melanerpes lewis*), Loggerhead shrike (*Lanius ludovicianus*), Long-billed curlew (*Numenius americanus*), Mountain quail (*Oreortyx pictus*), Yellow rail (*Coturnicops noveboracensis*), Klamath redband trout *(Oncorhynchus mykiss)*, Slender sculpin *(Cottus tenius),* Upper Klamath Lake lamprey *(Lampetra tridentata)*, Northern sagebrush lizard (*Scelopsus graciosus)* Western pond turtle *(Clemmys marmorata)* and breed on KWA, some in good numbers, while others breed in nearby habitats and use KWA as a foraging area: American white pelican (*Pelecanus erythrorhynchos*), Caspian Tern (*Hydroprogne caspia*), *Swainson's hawk (Buteo swainsoni)*, Trumpeter Swan (*Cygnus buccinators*) and White-breasted nuthatch (*Sitta carolinensis aculeate*). Others are former breeding species: Burrowing owl (*Athene cunicularia hypugaea*) and Snowy egret (*Egretta thula*). Some utilize KWA habitats during migration periods: Common nighthawk (*Chordeiles minor*), Franklin's gull (*Leucophaeus pipixcan*), Peregrine falcon (*Falco peregrinus anatum*), Western bluebird (*Sialia mexicana*), Yellow-breasted chat (Icteria virens) and Silver-haired bat *(Lasionycteris noctivagans)*.

Several species discussed previously are also Strategy Species identified in Table 2 as defined in the OCS. Key Species are Strategy Species with special emphasis within a conservation opportunity area. The OCS prescribes conservation activities to be implemented that contribute to overall health of strategy habitats and species. KWA's diverse habitat management actions, activities and programs contribute to conservation of OCS species in the East Cascades Ecoregion.

Table 3. Federal- or State-listed Endangered, Threatened, Candidate and Species of Concern animals and plants potentially present on Klamath Wildlife Area.
(Federal Status: C–Candidate; E–Endangered; SC–Species of Concern; T–Threatened
State Status: C – Critical; E – Endangered; T – Threatened; S – Sensitive V – Vulnerable
Oregon Conservation Strategy (OCS) Strategy Species present - x, Key Species - X)

Common Name (*Scientific Name*)	Federal Status	State Status	OCS
Amphibians			
Western toad *(Bufo boreas)*		S	x
Birds			
American white pelican (*Pelecanus erythrorhynchos*)		SV	X
Black-necked stilt (*Himantopus mexicanus*)		S	x
Caspian tern (*Hydroprogne caspia*)		S	X
Common nighthawk (*Chordeiles minor*)		S	x
Franklin's gull (*Leucophaeus pipixcan*)		S	x
Greater sandhill crane *(Grus canadensis)*			x
Lewis's woodpecker (*Melanerpes lewis*)	SC	S	X
Loggerhead shrike (*Lanius ludovicianus*)		S	x
Long-billed curlew (*Numenius americanus*)		S	X
Mountain quail (*Oreortyx pictus*)	SC	S	x
Peregrine falcon (*Falco peregrinus anatum*)		S	x
Snowy egret *(Egretta thula)*		SV	X
Swainson's hawk (Buteo swainsoni)		SX	
Trumpeter swan (*Cygnus buccinator*)		S	X
Western bluebird (*Sialia mexicana*)		S	x
White-breasted nuthatch (*Sitta carolinensis aculeate*)		S	x
Yellow rail (*Coturnicops noveboracensis*)	SC	S	
Yellow-breasted chat (Icteria virens)	SC	S	x
Fish			
Klamath redband trout *(Oncorhynchus mykiss)*	SC	S	
Lost River sucker *(Deltistes luxatus)*	E	E	X
Shortnose sucker *(Chasmistes brevirostris)*	E	E	X
Slender sculpin *(Cottus tenius)*	SC	S	X
Upper Klamath Lake lamprey *(Lampetra tridentata)*	SC		X
Mammals			
Silver-haired bat *(Lasionycteris noctivagans)*	SC	S	X
Reptiles			
Northern sagebrush lizard (Scelopsus graciosus)	SC		
Western pond turtle (Clemmys marmorata)	SC	SC	X
Plants			
Applegate's milk-vetch (Astragalus applegatei)	E	E	X

Non-Native Species

Non-native wildlife on KWA includes invasive pest species such as European starling *(Sturnus vulgaris)* and house sparrow *(Passer domesticus)*. These species compete with cavity nesting native species. Game birds such as ring-necked pheasants have been introduced and are managed to provide hunting opportunities. Naturally reproducing populations now occur and are augmented by translocation of wild birds. Feral cats *(Felis domesticus)* exert considerable predation pressure on native bird species as well as introduced game birds. House mice *(Mus musculus)* occur at the Headquarters Complex. The occurrence and distribution of non-native plant species is unknown since comprehensive surveys have not been conducted, however, large numbers of non-native plants are present on KWA. The origin of most is unknown, but some desirable species continue to be utilized and have been cultivated in agricultural and other upland areas, as well as in pastures and meadows. Many non-native plant species appear to be beneficial as forage or cover as evidenced by wildlife use and do not appear to have serious deleterious effects on habitat.

Several species of noxious weeds found on KWA are listed in **Table 4**. Most noticeable and of greatest concern are reed canary grass (*Phalaris arundinacea*), yellow starthistle (*Centaurea solstitialis*), teasel (*Dipsacus sylvestris Huds.*), poison hemlock (*Conium maculatum*), perennial pepperweed (*Lepidium latifolium*), hoary cress (*Lepidium draba*), and thistles (bull (*Cirsium vulgare*), Canada (*Cirsium arvense*), and plumeless (*Carduus acanthoides*)). Many of these species displace native vegetation and/or are of limited value to wildlife. Noxious weed control efforts involve chemical spraying, mowing and hand pulling or chopping as an annual activity focused on these species.

Monitoring

Annual program activities are in place to monitor wildlife populations, habitat use and other features. Wildlife response to habitat developments is a major objective of most surveys. Data are collected by administrative units and in some cases, specific localities, habitats or vegetative types based upon survey objectives. Population data are used to monitor effectiveness of population management plans, especially for selected waterfowl species. Data are analyzed, maintained on site, and reported to department program managers, Pacific Flyway Council Study Committees, and to interested publics.

Habitat monitoring strategies will be listed in the habitat related Objectives and Strategies portion under each habitat objective.

Table 4. Noxious weeds (Department of Agriculture A or B List) found on Klamath Wildlife Area. (*Invasive plants identified in 2016 OCS)

Common Name	Scientific Name	Occurrence
Bull thistle	*Cirsium vulgare*	Abundant
Buffalo bur	*Solanum rostratum*	Rare
Canada thistle*	*Cirsium arvense*	Abundant
Cutleaf teasel	*Dipsacus laciniatus*	Uncommon
Dalamatian toadflax*	*Linaria genistifolia* spp. Dalmatica	Rare

Field bindweed	*Convolvulus arvensis*	Uncommon
Hoary cress	*Lepidium draba*	Uncommon
Kochia	*Kochia scoparia*	Common
Mediterranean sage	*Salvia aethiopis*	Rare
Medusahead rye	*Taeniatherum canput-medusae*	Rare
Musk thistle	*Carduus nutans*	Rare
Perennial pepperweed*	*Lepidium latifolium*	Abundant
Plumeless thistle (A List)	*Carduus acanthoides*	Rare
Poison hemlock	*Conium maculatum*	Common
Puncturevine	*Tribulus terrestris*	Rare
Quackgrass	*Agropyron repens*	Uncommon
Russian knapweed	*Acroptilon repens*	Uncommon
Saltcedar	*Tamarix ramosissima*	Rare
Scotch thistle*	*Onopordum acanthium*	Common
Yellow flag iris	*Iris pseudacorus*	Common
Yellow Starthistle	*Centaurea solstitialis*	Rare

Waterfowl and other waterbirds
Routine surveys includes spring and fall waterfowl surveys, waterfowl pair surveys, waterbird nesting, and brood surveys done by department personnel. Special waterfowl surveys (Flyway-wide dark and white goose surveys, Winter Waterfowl Inventory) are coordinated with the Pacific Flyway Study Committee to monitor specific populations as per species-specific management plans.

Special surveys for breeding spring and fall shorebirds and colonial waterbird have been conducted annually but are frequently incomplete due to staffing shortages, conflict with other activities and inadequate funding.

A coordinated Pacific Flyway banding project was initiated in 1991 and continues to date. About 400 ducks and 100 geese are banded annually at KWA. Banding data is used by the USFWS for flyway duck harvest, survival analysis and for hunting season regulation recommendations. Monitoring and reporting of neck-collared waterfowl and band encounter/recovery data are collected and reported by wildlife area and watershed district personnel.

Other Wildlife
Threatened and sensitive species are recorded during periodic wildlife population surveys. Furbearer harvest data is collected annually. Breeding bird surveys are conducted to document and monitor passerines and other nongame bird species. Predator observations are recorded to establish population indices.

Upland Game Birds
Upland game bird production surveys are conducted to document those populations.

Big Game
Occasional deer trend and herd composition surveys are conducted to document populations and habitat use.

Fish
Trophy redband trout (Oncorhynchus mykiss) fishing is exercised along the periphery of the Shoalwater Bay as well as Sesti Tgawaals units. Limited large-mouthed bass fishing is done in the Klamath River near Gorr Island Unit. Game fish are not abundant on or near the Miller Island Unit. Harvest is anecdotally recorded in Upper Klamath Lake by Oregon State Police (OSP) law enforcement and USFWS personnel during the year.

Wildlife Diseases
Minor outbreaks or individual birds afflicted with avian cholera, botulism and lead poisoning are monitored by KWA staff and occur annually. Wildlife which appear to be sick are sent to the department's wildlife veterinarian for subsequent disease testing as necessary.

Vector Control
Klamath Vector Control District monitors mosquito populations throughout their district, including KWA, as part of their routine surveillance program. The surveillance program was created to provide a systematic method of locating mosquito breeding sources and monitoring mosquito populations and mosquito-borne disease activity. Determining which mosquito species are present, where they breed, and when they are active provides essential information needed for choosing the proper inspection and control strategy.

Vegetation
Limited vegetation mapping has been conducted to document habitat types. Fine scale mapping and surveys are planned to document distribution, changes in abundance and composition of various species and/or habitat types. An inventory of noxious weed distribution is in place and updated annually.

Water Use
Water use for irrigation and wildlife habitat management is monitored monthly through an extensive flow and water level measurement program. Pump volumes are determined and recorded. Use reports are prepared annually and forwarded to the department's Engineering Section for submission to Oregon Water Resources Department.

Public Use
Hunter use and harvest data are collected and reported on an annual basis, with local staff maintaining over 40 years of trend data. Hunter participation and harvest are determined through return of mandatory individual daily check in and check out permits which must be carried on the hunter while on KWA.

Observations of hunter performance by area personnel during hunting seasons are collected to document changes in hunter behavior and ethics through time. Wildlife viewing and other recreational use was estimated monthly from KWA staff observations,

however from 2016-2018 visitor use surveys were conducted using a vehicle counter and a 2017 randomized visitor use surveys.

Cultural Resources

Miller Island is located near the southern tip of the territory occupied by the Klamath Indians. Several accounts of the Klamath are available which provide abundant information on Klamath settlements, lifeways, and material culture.

The Klamath were comprised of five “groups” or tribal subdivisions. The Klamath Falls group resided primarily between Modoc Point and Klamath Falls, but their territory apparently also included Miller Island (Spier, 1930:19). The ethnographic record shows little use for the area of Miller Island, however. Spier plots sixteen settlements for the Klamath Falls group, none of which fall south of Klamath Falls (Spier, 1930:17). In describing the groups seasonal movements, Spier notes that they moved to the marshes west of Upper Klamath Lake or to Lost River in the summer while wintering along the eastern shore of Upper Klamath Lake (Spier, 1930:19). It is likely that Miller Island was relatively little used by Klamath Indians given its location along a marshy and often flooded portion of the Klamath River.

By 1843 the westward migration on the Oregon Trail was well underway and it would be only a few more years before a settlement in the Klamath Basin would begin. The town of Linkville was formed at the mouth of the Link River by George Nurse in 1867. In 1893 the name of the town was changed to Klamath Falls and would eventually be incorporated as the City of Klamath Falls by the state legislature in 1905.

Also in 1905, the federal government announced it would fund construction of the Klamath Reclamation Project which became operational by 1906. Klamath Falls was known for its forests and rangeland but the region was too remote from major markets to make money.

In 1909, the Southern Pacific Railroad arrived in Klamath Falls and the local economy began to grow. In the 1920s Klamath Falls was the fastest growing city in Oregon until the Great Depression of 1929 brought the lumber boom to an end

In the late 1800s, the Klamath Basin was dominated by about 185,000 acres of shallow lakes and extensive marshes. These lakes and marshes, with their rich soils and abundant food, attracted peak fall concentrations of over six million waterfowl, provided vital nesting and brood-rearing habitat, and supported large concentrations of marsh birds such as pelicans, cormorants, egrets, and herons.

Water was first diverted for agricultural irrigation purposes in 1882, and by 1883 about 13,000 acres of farmland were being irrigated by local agriculturalists. In that year, the U.S. Bureau of Reclamation conducted investigations which ultimately led in 1904 to the first withdrawal of land by the Secretary of the Interior for developing a federal irrigation project.

The Klamath Reclamation Project was authorized on May 1, 1905, and called for the eventual irrigation of 235,400 acres. Construction on the project began in 1906, and water was first made available for irrigation on May 22, 1907. This initial construction was followed by the completion of the Clear Lake Storage Dam in California in 1910 and the Lost River Diversion Dam in Oregon in 1912.

Draining Klamath Basin wetlands to create agricultural lands thereby destroying waterfowl habitat (of the original 185,000 acres of wetlands, less than 36,000 acres exist today) was very controversial at the time. As a result, on August 8, 1908 President Theodore Roosevelt set aside the “Klamath Lake Reservation” as the first waterfowl refuge in the nation (Executive Order Number 924). In 1958, the state of Oregon established the “Klamath Game Management Area”.

The Federal refuge system has grown to include five satellite refuges in the Klamath Basin, the combination of which are significantly larger than KWA. The acquisition and development of KWA is supplemental to the federal program.

Social Environment

Demographics

Klamath County is the fourth largest county in Oregon encompassing more than 6,100 square miles. Considered high desert, the region receives an average of 300 days of sunshine per year. Klamath Lake, which covers 133 square miles, borders the city of Klamath Falls on the north and is the largest natural lake west of Great Salt Lake.

Klamath County has a population of 66,443 with most of its residents located within the county seat and urban growth boundary of Klamath Falls. The urban growth boundary of Klamath Falls consists of 41,100 residents, which includes 21,524 residents of the City of Klamath Falls.

Land Use

KWA is predominantly surrounded by agriculture and rural residential land uses. **Figure 3** shows the land uses which border the wildlife area.

Infrastructure

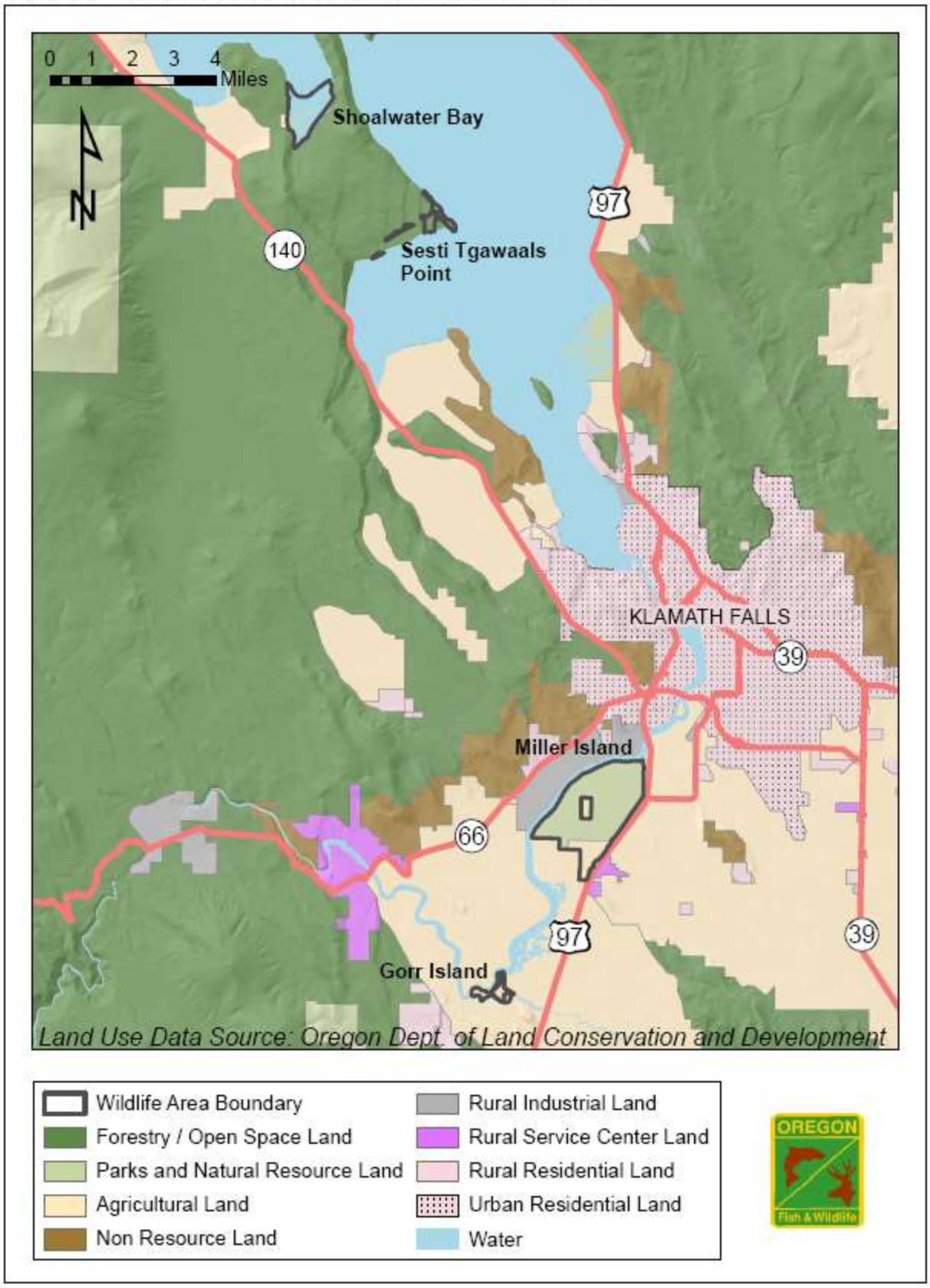
Developments/Facilities

Major facilities development occurs primarily at KWA's Miller Island Unit (see **Table 5**). This development consists of two residences, maintenance and equipment shops, two two-car garages, two storage sheds, office building, hunter check station, bunkhouse, barn, two granaries, and two other small utility buildings. There are two storage buildings at Delameter HMU and one building at Hamaker Uplands HMU. There is also a pre-cast concrete vault toilet at the boat ramp located between Hamaker and Hooper Lowlands. The office has a public information lobby,ADA accessible restroom and ADA parking area. The checkstation building is an ADA accessible facility with an ADA accessible chemical toilet. The domestic drinking water system on the Miller Island Unit

is comprised of three separate wells which provide water to the Headquarters office and residence, the bunkhouse, and the assistant's residence.

Fifteen parking lots with associated signage are located on the Miller Island Unit of KWA. There are three public picnic areas with tables two having associated chemical toilets. There is no potable water available. There is one county access road to Shoalwater Bay Unit which also accesses Eagle Ridge County Park. A secondary road which is seasonally closed nearly accesses Sesti Tgawaals Unit, but a short walk is necessary. Gorr Island Unit is accessible only by boat. The Miller Island Unit has three public access locations from State Hwy 97. One is a paved road (Miller Island Road), one is a seasonally closed graded gravel road which accesses the Rayson HMU, and the other is a seasonally closed unimproved road accessing from the south end of Miller Island. This road is generally impassable during inclement conditions due to a lack of rock base.

Figure 3 - Land Use Surrounding Klamath Wildlife Area



The boat ramp on Miller Island Unit accesses the Klamath River, and is the only public boat launch between Klamath Falls and Keno (approximately 20 river miles). There is a wheelchair accessible concrete vault toilet available at the boat ramp parking lot.

Much of the fencing on the Miller Island Unit has been removed, however about 20 miles of boundary and livestock pasture fences are still present.

Table 5. Facilities and Developments on the Klamath Wildlife Area.

Development	Quantity	Location
Boat ramp	1	Hooper Lowlands
Bunkhouse	1	Headquarters HMU
Check station	1	Gregory HMU
Equipment shed	1	Headquarters HMU
Fences	20 miles	Miller Island Unit
Fish protection screen - Traveling Belt	1	Miller Slough HMU
Fish protection screen - Pump	2	Largent Lowlands (2)
Fish protection screen - Rotary Drum	4	Hooper Lowlands HMU, Delameter Lowlands HMU, Hamaker Lowlands HMU, Largent Lowlands HMU
Flight pen	1	Headquarters HMU
Game bird pens	2	Headquarters
Garage	2	Headquarters, Largent HMU
Gas building	1	Headquarters HMU
Hay barns	1	Headquarters HMU
Headquarters office	1	Headquarters HMU
Host site	2	Headquarters, Blockhouse
Maintenance shop	2	Headquarters HMU
Parking lots	15	Miller Island Unit
Picnic areas	2	Miller Slough HMU, Delameter HMU
Public restrooms	2	Gregory HMU (ADA), Boat Ramp (ADA)
Staff residence	2	Headquarters, Largent HMU
Storage building	6	Headquarters (2), Hooper Lowlands, Delameter (2), Blockhouse
Tree and shrub plots	10 acres	Headquarters, Rayson HMU, Largent HMU, Gregory HMU,Miller Slough HMU and Blockhouse.
Viewing areas	3	Miller Island Unit

Water Rights

The Miller Island Unit is the only unit with existing water rights which are described below:

1. The Klamath River forming the north and west boundary of the project area furnishes water for irrigation and waterways on 1090 acres. The duty of 4010 acre feet of water is obtained from the Klamath Reclamation project through eight contracts through the U.S. Bureau of Reclamation.

2. Two additional temporary contracts with Klamath Irrigation District allow irrigation of 6.15 acres of cropland.

3. Three state water rights acquired with previous land purchases provide for 17.02 cubic feet per second (cfs) from the Klamath River.

4. One adjacent landowner has two unending agreements with the project to obtain water for livestock and irrigation through 1.25 miles of project canal. Seven intake canals with control gates are developed to disperse water through 2.6 miles of canals to eight pumps used for filling waterways and irrigating crops.Three canals, totaling 2.6 miles, provide for return of excess water to the Klamath River at four drain pumps.

4. Klamath Basin Water Rights Adjudication process is still ongoing at this time. KWA'soriginal claim for 26 cfs to irrigate approximately 1051.6 acres has gone through numerous iterations and the proposed order by the administrative law judge has granted a priority date of 1900 with a rate of 17.5 cfs and a duty of 2100.3 acre feet of water per year on 700.1 acres.

Shoalwater Bay, Sesti Tgawaals Point, and Gorr Island Units are all open systems and do not require water rights.

Appendix D describes in greater detail the State and local Irrigation District water rights which are currently held on KWA.

Easements/Access Agreements

The Miller Island Unit is the only unit with dedicated easements. The easements are:

1. Power transmission line easements to Pacific Power and Light Company.

2. Telephone line easements to U.S. West.

3. A road easement to Klamath County that consists of one mile of graveled road starting at the end of the paved portion of Miller Island Road heading SE along the S portion of the Miller Island Unit.

4. A water canal easement to Lewis Furber for the acquisition of Klamath River water located between the Hamaker and Delamater tracts.

Appendix E lists the easements and access agreements occurring on the Klamath Wildlife Area.

Land Acquisition and Adjustment

It is the policy of the Department to only acquire land or interests in lands, including easements and leases, from willing sellers, consistent with statutory authority and the department's mission. Acquisitions and adjustments must be for conservation of fish and wildlife and their habitats and to provide fish and wildlife oriented public use for educational and recreational purposes. Land adjustments would allow for sale, trade or exchange of land with willing landowners to enable the department to consolidate wildlife area boundaries.

There are three categories of lands that may be considered for acquisition. These include: 1) Significant or unique habitats, especially those beneficial to endangered, threatened, or sensitive species; 2) Sites, or access to sites that provide wildlife-related recreational opportunities; and, 3) Properties to facilitate the performance of the department's mandated duties (e.g., storage and warehouse, feeding barns, etc.).

At present, land uses on adjacent private land are compatible with most KWA management activities. One 80 acre inholding exists within the present day exterior boundaries. No major acquisitions have occurred since 1968.

Currently, private lands provide significant migration habitat for a variety of waterbirds. Nesting and brood rearing habitat effectiveness on those properties is variable due to crop irrigation, haying, livestock grazing and is dependent on timing and intensity of those land uses.

Public Use

Public Access

- January 1 - January 31: Open to public use daily.
- February 1 - April 30: Public use is restricted to public roads, parking areas, boat ramp, and designated birding trail and designated dog training area to minimize disturbance to migrating waterfowl.
- May 1 - September 30: Open to public use daily.
- October 1 – December 31: Open to public use Monday, Wednesday and Saturday.
- A daily closure from 10pm – 4am is also in effect to reduce unwanted activity on Miller Island Unit.
- A regulated hunting program is in effect on Miller Island Unit, but the outlying units, Gorr Island, Shoalwater Bay and Sesti Tgawaals Point units are open to hunting without permit during hunting seasons. Hunting use on Miller Island Unit

is quantified through the requirement of daily hunting permits and staffed check station.

For the purposes of this plan, all non-hunting, trapping, or angling related activities (viewing, photography, hiking, etc.) are collectively referred to as wildlife viewing.

Wildlife viewing use is difficult to accurately assess due to several points of entry and the lack of a permit or registration program.

Hunting, Trapping, and Angling

Hunting and angling are very popular recreational activities enjoyed on KWA (see **Table 6**).

Providing public hunting opportunity was a major objective for the acquisition of KWA, and revenues derived from hunting related expenditures are the sole funding source for KWA operations Hunter use increased steadily from when KWA was established (1958) through the late 1990s.

Trapping during the hunting season may conflict with the regulated hunting program's objectives so trapping is closed until the waterfowl hunting season ended in mid-January.

Currently, trappers harvest furbearers on Miller Island Unit from the end of the waterfowl hunting season in late-January through the end of February when spring migrating geese begin to arrive. Miller Island trappers harvest between 300 and 500 muskrats per year. Other furbearer catches of mink, raccoon, weasel, and skunk are incidental. Trapper harvest of furbearers at Shoalwater Bay, Sesti Tgawaals Point, and Gorr Island units is unknown. All three units are open to trapping seven days a week during regulated trapping seasons, with no permit requirement.

Table 6. Estimated Annual Hunting, Trapping and Angling Use Days on Klamath Wildlife Area.

Activity	Estimated Annual Use Days
Hunting	
Big Game	0
Waterfowl	1200
Upland Game	1000
Unprotected Wildlife	50
Trapping	60
Angling	50
Total	**2360**

Wildlife Viewing

KWA is open to public access year around for wildlife viewing related activities. (see **Table 7**).

Wildlife viewing use has increased dramatically during the past ten years and is estimated to be 27,640 visitor use days annually. Viewers utilize the same infrastructure that serves the hunting public, and during the non-hunting season a much larger portion of KWA is open or available for use.

Wildlife viewing is largely unregulated, with a wide array of opportunities available. Other than vehicular access, at present there are few restrictions on visitor use of KWA.

- Parking lots and other public use facilities are maintained.
- Two wheelchair accessible hunting and viewing blinds have been constructed, as well as one accessible viewing only blind and one accessible overlook.
- One six sided informational kiosk.
- An informational register containing wildlife sightings, maps and other information is maintained at the Headquarters Complex.
- Wildlife Area Hosts and other volunteers have been utilized to provide additional assistance to visitors.
- The Audubon Christmas Bird Count, waterfowl banding, and numerous special tours and slide programs are conducted annually.
- Demand for uses not compatible with wildlife management is increasing, and is prohibited or discouraged to prevent such use patterns from becoming established.
- Off road vehicle use is prohibited.

Table 7. Estimated Annual Wildlife Viewing and Education Use Days on the KWA.

Activity	Estimated Annual Use Days
Wildlife Viewing/Photography	21,100
Dog training	2,800
Boat ramp use	1,300
Educational and scientific	590
Other miscellaneous (e.g. picnicking)	1,850
Total	**27,640**

Educational/Interpretive

KWA is used by a variety of educational groups including local and distant school districts, colleges, universities, various Scouting groups and Elderhostel groups. Educational groups can use the area on their own or arrange for guided tours by department staff. Informational talks and slide shows are presented to many groups upon request and in conjunction with special projects.

Objectives and Strategies

Objectives and Strategies

As stated previously, objectives are concise statements of what the Department wants to achieve, how much the Department wants to achieve, when and where to achieve it and who will be responsible for the work. Objectives derive from goals and provide the basis for determining strategies. Strategies describe the specific actions, tools, techniques or a combination of these elements used to meet an objective. Goals, objectives and strategies in the plan were derived from following an ecosystem based management philosophy.

The following objectives and strategies are based on the three goals described earlier. They identify the management activities and priorities of the KWA Management Plan:

Goal 1: To protect, enhance and manage upland habitats to benefit a wide variety of wildlife species, with emphasis on reducing depredation on adjacent agricultural lands by spring migrating geese.

Upland habitat on KWA consists of salt desert scrub, sagebrush steppe and agricultural areas. Although much of the uplands on Miller Island Unit have been altered through brush removal, farming, grazing and planted livestock forage, there still exists small interspersed, un-altered blocks of native habitat. Upland habitat supports a wide variety of native wildlife species. During breeding season ground nesting birds and other wildlife make extensive use of uplands, especially in sites adjacent to wetlands. Dense nesting cover has been cultured at several sites on KWA and receives heavy use by a variety of duck species. Many native bird species as well as desired introduced game birds, such as pheasant, also meet their lifecycle needs in uplands.

Many of the management strategies described below occur in salt desert scrub habitat, and will meet spatial and temporal needs of OCS priority species found in this priority habitat of the East Cascade Ecoregion.

Objective 1.1: Manage approximately 580 acres of agricultural upland habitat with emphasis on spring green forage.

Rationale

This habitat type occurs as a result of conversion of native salt desert scrub and sagebrush steppe habitats by previous private landowners. Agricultural crops can ameliorate limiting habitat features and increase the carrying capacity of these sites to benefit a wide variety of native wildlife and desirable game species. Recent increases in flyway populations of white-fronted, snow, and Ross' geese combined with higher production expenses, has resulted in increased concerns in the Klamath Basin related to spring goose depredation on agricultural crops. Spring green forage plots provide forage for staging snow, Ross', and white-fronted geese while attracting them off of adjacent private ownership. Green forage plots are almost exclusively pre-conditioned for spring goose use by the use of cattle grazing, sharecropping, or burning. It is the

department's intent through this plan, to continue, if not increase, preconditioning utilizing these three main techniques. Grazing and forage removal consistent with Oregon Administrative Rule (OAR) 635-008-0040, Forage Removal from State Lands, will be continued where the infrastructure allows. Burning will be utilized in units which are not irrigable, and where lack of fencing or developed water sources preclude permit grazing.

Through this plan the department proposes to convert additional upland acreage into spring green forage resources. This acreage is currently set aside for waterfowl nesting but is likely in excess of what is needed for waterfowl production. Small cereal grains, forbs and tree and shrub plantings provide an abundance of food for many species. Tree and shrub features are limited in the area and additional plantings will provide habitat to enhance wildlife diversity. Invasive plants will be monitored and controlled consistent with Federal Assistance regulations. The OCS states that "Non-native plant and animal invasions disrupt native communities, diminish populations of at-risk native species, and threaten the economic productivity of resource lands." Other features can be developed to further increase carrying capacity and expand distribution and habitat use for many species.

Strategy 1. Maintain, develop, and enhance green forage plots for spring staging geese. Some historic upland areas which were managed for nesting cover will be evaluated for inclusion in this green forage acreage. Activities include identifying appropriate sites and determination of habitat manipulation methods (replanting, mowing, burning, disking, etc.) Improved pastures in the Hooper, Hamaker, Delameter and Largent HMUs will continue to be pastured, under Department permit, by one private cooperator. Sharecropping of the Largent and Delameter HMU alfalfa fields will continue under Department permit with the current private cooperator. Burning will be utilized in the Rayson HMU where grazing infrastructure does not exist.

Strategy 2. Maintain and enhance small cereal grain crops on appropriate tracts to provide wintering and early spring migrating waterfowl an attraction to develop use patterns on Miller Island Unit. Annual soil preparation, seeding, and irrigation will be necessary.

Strategy 3. Coordinate with adjacent landowners to explore potential opportunities to develop more spring green forage resources on private land.

Strategy 4. Develop additional tree and shrub plots at homestead sites and other agricultural areas where this type of habitat is limited. Activities include identifying appropriate sites, soil preparation, planting and irrigation as well as protection from browsing or girdling by beavers.

Strategy 5. Maintain existing tree and shrub plots. Work includes planting to replace mortalities, competitive vegetation management, fertilization and irrigation.

Strategy 6. Maintain food and cover crop plantings on 50-200 acres. Activities include farming with tractors and implements to accomplish soil preparation, planting and culture of food and cover crops. Irrigation of crops will be utilized in several locations.

Strategy 7. Utilize integrated pest management to control invasive plant species, focusing on noxious weeds. Activities will entail monitoring, searching for and treating infestations utilizing best management practices and techniques. Invasive plant species, abundance, and distribution will be monitored as well as successfully treated acreage. Acreages will be determined by either visual estimation or GIS mapping.

Strategy 8. Annual monitoring of agricultural uplands will include comparing the acreage targets in Objective 1.1 with the acreages attained in the above strategies. Monitoring will be by Habitat Management Unit or other geographic or administrative boundary. Acreages will also be determined by either visual estimation or GIS mapping.

Objective 1.2: Manage approximately 452 acres of sagebrush steppe habitat with grass and forb components consisting of 25 percent of the area with the remainder consisting of an open shrub layer of sagebrush and/or greasewood.

Rationale

Sagebrush steppe and salt desert scrub habitats are the most extensive of the unmanaged upland habitats found on KWA. Black greasewood and other alkaline adapted shrubs, grasses (especially saltgrass) and forbs dominate the salt desert scrub. Sagebrush species were also a major component within both habitat types. These habitat types were the primary areas used by private landowners for early homesteading on Miller Island Unit. Prior to the Department's acquisition of KWA, significant amounts of these habitats were altered or converted to croplands to support agricultural or livestock grazing operations.

Altered habitat can be reclaimed or intensively managed to restore or enhance productivity for wildlife use. Many wildlife species forage on the wide variety of seeds, vegetation and invertebrates found in this habitat type. A wide variety of breeding wildlife species (primarily passerines) use this structurally diverse and species rich vegetation.

Salt desert scrub habitat occurs adjacent to and within palustrine wetlands, and as a result receives considerable use by ground nesting waterbirds for breeding. Dense nesting cover adjacent to wetland habitats is ideal for many waterfowl species, providing structure and protection from predation and disturbance. Newly hatched broods have reduced exposure to predation as they travel to wetlands. Significant portions of this habitat are in a near natural, undisturbed condition, and are utilized by a wide variety of native wildlife species. Salt desert scrub habitat meets essential life history functions for a variety of wildlife species including foraging, nesting, brood rearing and escape cover. Invasive plants will be monitored and controlled consistent with Federal Aid regulations. The OCS states that "Non-native plant and animal invasions disrupt native communities,

diminish populations of at-risk native species, and threaten the economic productivity of resource lands."

Strategy 1. Manage and enhance dense nesting cover in close association to wetland habitats for waterfowl and other ground nesting wetland dependent wildlife. Activities include the use of controlled burning and/or periodic grazing to maintain site productivity.

Strategy 2. Utilize integrated pest management to control invasive plant species, focusing on noxious weeds. Activities will entail monitoring, searching for and treating infestations utilizing best management practices and techniques. Invasive plant species, abundance, and distribution will be monitored as well as successfully treated acreage. Acreages will be determined by either visual estimation or GIS mapping.

Strategy 3. Annual monitoring of salt desert scrub and sagebrush steppe uplands will include comparing the acreage targets in Objective 1.2 with the acreages attained in the above strategies. Monitoring will be by Habitat Management Unit or other geographic or administrative boundary. Acreages will also be determined by either visual estimation or GIS mapping.

Objective 1.3: Maintain and protect approximately 20 acres of upland habitat where federally listed Applegate's milk-vetch occurs. This habitat is characterized by seasonally moist, strongly alkaline soils dominated by greasewood with sparse, native bunch grasses and patches of bare soil.

Rationale

Applegate's milk-vetch is a perennial plant species in the legume family (Fabaceae) listed as endangered by the U.S. Fish and Wildlife Service. Believed extinct until its rediscovery in 1983, Applegate's milk-vetch is currently known to exist at three sites which collectively support an estimated 12,000 individuals. The species is a narrow endemic, known only from the Lower Klamath Basin (i.e., the plain containing Lower Klamath Lake) near the city of Klamath Falls, Klamath County, in southern Oregon.

Applegate's milk-vetch is restricted to flat-lying, seasonally moist, strongly alkaline soils. Although currently replete with introduced grasses and other weeds, the species' habitat was historically characterized by sparse, native bunch grasses, and patches of bare soil. Intensive agricultural and urban development of the Klamath River floodplain has resulted in severe depletion and fragmentation of the species' habitat. The plant is known to be extant at only three sites.

Virtually all remaining potential (undeveloped) habitat for the species has been seriously modified by the proliferation of weeds, suppression of floods and fires, and land reclamation projects involving extensive construction of drainage ditches and water retention dikes.

Because of habitat modification, Applegate's milk-vetch may be limited by competitionwith exotic weeds. Threats to this plant are intensified by the low abundance and limited
distribution of remaining populations, which increases the milkvetch's vulnerability to extirpation due to random mortality events. Furthermore, two of the three extant populations support fewer than 500 individuals, possibly not enough to maintain the genetic variability necessary for long-term population viability. Expansion of Applegate's milk-vetch appears to be limited by caterpillars feeding on the plants, low seed production, and seed loss to pre-dispersal predation by adult and larval beetles.

Strategy 1. Coordinate habitat manipulation projects with management partners (Oregon Department of Agriculture, The Nature Conservancy and USFWS) including controlled burns and mowing.

Strategy 2. Utilize integrated pest management to control invasive plant species, focusing on noxious weeds. Activities will entail monitoring, searching for and treating infestations utilizing best management practices and techniques. Invasive plant species, abundance, and distribution will be monitored as well as successfully treated acreage. Acreages will be determined by either visual estimation or GIS mapping.

Strategy 3. Cooperate with research and re-introduction efforts relative to Applegate's milk-vetch.

Strategy 4. Annual monitoring of Applegate's milk-vetch will include comparing the acreage targets in Objective 1.3 with the acreages attained in the above strategies. Monitoring will be by Habitat Management Unit or other geographic or administrative boundary. Acreages will also be determined by either visual estimation or GIS mapping.

Objective 1.4: Protect approximately 100 acres of upland forest habitat, characterized by large ponderosa pine, a habitat used by nesting and wintering bald eagles.

Rationale
Eagles are monogamous and have a high fidelity to a nest site, using the same nest tree annually. If one of the pair dies, the other member will attract another mate to the same breeding area.

Strategy 1. Monitor condition of nest trees on Sesti Tgawaals Point Unit and assure adequate recruitment of replacement trees for future nesting.

Strategy 2. Coordinate with the Oregon Eagle Foundation (OEF) to monitor use and fledgling success on bald eagle nests on Klamath Wildlife Area.

Strategy 3. Utilize integrated pest management to control invasive plant species, focusing on noxious weeds. Activities will entail monitoring, searching for and treating infestations utilizing best management practices and techniques. Invasive plant

species, abundance, and distribution will be monitored as well as successfully treated acreage. Acreages will be determined by either visual estimation or GIS mapping.

Strategy 4. Annual monitoring of the upland forest habitat will be in cooperation with department staff, USFWS, and Oregon Eagle Foundation. General condition of nest trees will be monitored, as well as presence of trees suitable for recruitment as a nest trees.

Objective 1.5: Maintain and improve wildlife area facilities, structures, and equipment used to conduct habitat management and public use projects.

Rationale
Facilities, structures and equipment are integral to the overall operation of KWA. Infrastructure and equipment must be maintained in good working order to accomplish habitat and wildlife management projects and to provide public use opportunities. Infrastructure includes the Headquarters Complex, associated residences and buildings. Equipment includes heavy equipment, dump trucks, tractors, agricultural implements, vehicles, ATVs, trailers, boats and shop tools.

Strategy 1. Maintain current Headquarters Complex including eight buildings, two residences, two host sites and associated utility infrastructure. Activities will include carpentry and repair, improvement of storage, landscape maintenance, and general facility structural maintenance and improvement.

Strategy 2. Conduct annual property inventories and maintain operational integrity of facilities, structures, equipment and vehicles. Activities will include conducting and reporting inventories, scheduled maintenance of all equipment/vehicles and completing repair and upgrades as necessary.

Strategy 3. Continue irrigation and water management practices to meet wildlife area habitat goals and objectives. Activities will include exercising water rights, monthly measurement or estimates and annual reporting of authorized water rights use on KWA to Oregon Water Resources Department.

Strategy 4. Continue proactive project administration actions and activities to address easement, property boundary encroachment and other issues affecting or impacting Wildlife Area operations. Activities will include identifying issues, preparing briefing documents and soliciting outside and internal assistance where appropriate.

Strategy 5. Monitor facility infrastructure and equipment on an annual basis to determine a priority list of maintenance or development issues. The list will be separated into capital improvements, capital purchases, and deferred maintenance.

Goal 2: To protect, enhance and manage wetland habitats to benefit fish and wildlife species.

A substantial portion of the Pacific Flyway waterfowl population passes through the Klamath Basin of the Intermountain West to wintering areas in California, Mexico, Central and South America. Many of these same species along with others make return migrations to breeding areas in Alaska, Canada and arctic Russia. The diversity of food resources in wetlands play an important role in replenishing or building energy reserves depleted or necessary during migration for a variety of species. In some cases energy is being stored in preparation for the physiological demands of breeding season. KWA is an important area for migrating waterfowl in the Klamath Basin and the Intermountain West Joint Venture. Joint Ventures are based on a cooperative approach to conservation by forming broad partnerships consisting of individuals, corporations, conservation organizations, and local, state, provincial, and federal agencies. These groups work together to protect, restore, and enhance wetlands and associated upland habitats in specific geographic regions.

Migration, molting, pair formation, and pre-breeding fat storage are life history events undertaken by waterfowl and a diversity of habitat types can meet the needs of a wide variety of species. Habitat management at KWA has historically met these life history needs and active management is necessary to enhance, maintain and restore productivity at the area. Permanent, intermittently exposed, semi-permanent and seasonal wetlands produce large amounts of natural foods in the form of seeds, foliage, tubers, and invertebrates that provide a diverse diet for a variety of waterfowl species.

Canada geese and 12 species of ducks breed on KWA. This population is important to conservation of Pacific Flyway waterfowl populations. Additionally, locally produced waterfowl constitute a major proportion of waterfowl harvested by hunters early in the season. Waterfowl produced at KWA are harvested in virtually every state and province in the Pacific Flyway. KWA's relatively stable and productive wetland base plays a critical role in providing habitat for many species of molting waterfowl that breed in more ephemeral habitats elsewhere in the Pacific Flyway. The protective cover, security afforded by large blocks of wetland habitats, and abundance and variety of food resources available on KWA provide ideal conditions during this energetically demanding and critical time period in the life cycle of waterfowl.

The diversity of wetland habitats on KWA meets the entire range of breeding season requirements for a wide range of waterfowl species (e.g. Canada geese to ruddy ducks). Strategies employed by the KWA staff will support many wetland habitat conservation actions to benefit priority waterfowl species identified in Pacific Flyway Management Plans.

Shorebirds make extensive use of the Klamath Basin, migrating to wintering areas in California and Central and South America. Many of these fall migrant species along with others make return migrations in spring to breeding areas in Alaska, Canada and the Russian Arctic. Immense concentrations of shorebirds can occur during brief time

periods. The diversity of food resources in wetlands play an important role for a variety of shorebird species in replenishing or building energy reserves depleted or necessary during migration. In some cases, energy is being stored in preparation for the physiological demands of breeding.

KWA is an important area for migrating shorebirds in the Klamath Basin. Research has revealed extensive connectivity of wetland use by shorebirds in the Klamath Basin during post-breeding dispersal and migration staging. KWA hosts large aggregations of many species during fall months and due to reliable water availability, plays an important role in this drought prone region. A variety of habitat types at KWA is available to meet the life history needs of shorebirds for migration, molt and pre-breeding fat storage. In addition, the diversity of wetland vegetation present results in structural cover and detritus that supports an abundant diversity of invertebrates providing food to a wide array of shorebird species.

KWA wetlands provide breeding habitat to seven shorebird species with a wide range of nesting and brood rearing requirements being met. These range from intermittently flooded lacustrine wetlands for plovers to intermittently flooded/saturated palustrine wetland favored by nesting Wilson's phalaropes (*Phalaropus tricolor*) and Wilson's snipe (*Gallinago delicata*). Dense or extensive emergent vegetation in portions of KWA results in reduced use by many shorebird species.

Strategies employed by the KWA staff will support many wetland habitat conservation actions to benefit shorebird species identified in the OCS, such as black-necked stilt and long-billed curlew.

Over 25 species of other waterbirds or wetland dependent and wetland obligate wildlife species utilize wetland habitats on KWA. Life cycle demands of breeding, post breeding dispersal and migration are met for many species in diverse habitats found on the area. These species forage extensively across all wetland types to build body reserves for migration, roost in shallow ponds or tall emergent vegetation or hunt prey. Again, wetland habitat management strategies will meet the spatial and temporal needs of OCS priority species found in this priority habitat of the East Cascades Ecoregion.

Objective 2.1: Manage approximately 185 acres of palustrine semi-permanently flooded wetlands on Miller Island Unit, with a ratio no greater than 3:1 of robust emergent vegetation (dominated by cattails and bulrushes) to open water. These wetlands should have open water and interspersed stands of vegetation to create a mosaic of features within individual habitat management units. Water depths will generally not exceed 24 inches and open water areas will support rooted submerged aquatic plants in most locations.

Rationale
A wide variety of migrant bird species take advantage of the diversity of food resources in these wetlands. Diving ducks and swans utilize open water areas to forage on submergent aquatic plants. Arctic nesting geese make extensive use of American three

square and alkali bulrush roots and tubers during migration. Seeds from both annual and perennial plants provide an abundant source of food to a wide variety of migrants as well as breeding species.

This habitat type is important for many species of breeding waterbirds including ducks, geese, waders, secretive marsh birds, colonial nesting waterbirds and wetland dependent passerines. Robust emergent vegetation provides nesting substrate for many species and cover for broods and molting waterfowl. Open water areas with submerged aquatic bed vegetation provide important foraging areas for all species, especially broods. Small fish, aquatic and emergent insects and other invertebrates provide additional food for migrating and breeding waterbirds.

Currently, the ratio of robust emergents to open water and interspersion of these habitat features is not ideal in some HMUs. Consequently, several strategies in this plan will address infrastructure modifications and habitat manipulations to improve and manage habitat diversity.

Timing of drawdowns can have significant effects on vegetation diversity, germination and productivity. A variety of drawdown strategies will be explored to determine which is most efficient to meet vegetation density, diversity and interspersion objectives.

Invasive plants will be monitored and controlled consistent with Federal Aid regulations. The OCS states that “Non-native plant and animal invasions disrupt native communities, diminish populations of at-risk native species, and threaten the economic productivity of resource lands.”

Ground and vegetation disturbing activities such as disking, herbicide use, mowing and prescribed fire can result in an intricate mosaic of habitat features and increased habitat diversity. These activities will require dry conditions in order to operate heavy equipment. Those conditions may be met only through multiple year drawdowns, without seasonal flooding. Extended periods of dry conditions will mimic natural and historically occurring drought cycles. When combined with subsequent ground and vegetation disturbing activities increased stress and reduced vigor of dense tall emergent vegetation will occur. Hunting and viewing access and opportunities will be enhanced long-term. However, during these habitat manipulations, Wildlife Area users will experience short -term loss of opportunity in accustomed or traditional site-specific locations.

Strategy 1. Regulate to provide timely flooding and receding water levels to improve food availability, maintain or enhance emergent and submergent plant growth and invertebrate populations. Work will include monitoring and adjusting wetland water levels year round with special emphasis during fall and spring migration peaks. It will occur across the entire area annually in conjunction with and complementing other strategies.

Strategy 2. Utilize moist soil and marsh management methods to enhance habitat diversity, improve open water to vegetation ratios and interspersion thereby increasing waterfowl foraging opportunities. This will result in successional set back of overly dense tall emergent stands and will foster availability and growth of desirable native wetland plant species. It will occur on 200 - 250 acres annually. Activities will entail drawdown and drying, on an annual or longer term interval coupled with vegetation and soil disturbance using burning, disking, herbicides, mowing and plowing.

Strategy 3. Utilize integrated pest management to control invasive plant species, focusing on noxious weeds. Activities will entail monitoring, searching for and treating infestations utilizing best management practices and techniques. Invasive plant species, abundance, and distribution will be monitored as well as successfully treated acreage. Acreages will be determined by either visual estimation or GIS mapping.

Strategy 4. Annual monitoring of semi-permanent wetlands will include comparing the acreage targets in Objective 2.1 with the acreages attained in the above strategies. Monitoring will be by HMU or other geographic or administrative boundary. Acreages will also be determined by either visual estimation or GIS mapping.

Objective 2.2: Manage approximately 792 acres of palustrine seasonally flooded wetlands with a minimum plant coverage of 80 percent.

Rationale

This habitat type usually occurs within larger units managed as semi-permanent wetlands. Water levels recede naturally as evapotranspiration occurs or as manipulated through active management actions. Sometimes seasonally flooded wetlands occur summer through early fall months as a result of run-off from adjacent irrigated lands. When overtly managed, this altered water regime can result in considerable production of desirable plant species. If not, adverse impacts can occur through nest flooding and invasive plant proliferation.

Seasonally flooded wetlands are important for breeding avocets and stilts. The shallow water habitat provided by seasonal wetlands provides foraging conditions for many species of wetland bird including rails, bitterns, and dabbling ducks. Timing of drawdown in spring months will make invertebrates available to migrating and breeding waterbirds.

Early summer drawdown creates excellent germination conditions for many species of important wetland plants such as suaeda, red goosefoot (*Chenopodium rubrum*) and smartweeds (*Polygunum spp*). Re-flooding these areas in late summer and early fall provide abundant food for fall migrating waterbirds. Depending on drawdown date seasonal flooded wetlands may be less valuable as brood rearing areas for many early nesting species, but are high quality brood rearing habitat for late nesting species.

Habitat manipulations may also include growing annual cereal grain crop on selected wetland units to set back encroachment of dense, tall, emergent vegetation.

Strategy 1. Regulate water to provide timely flooding and receding levels to improve food availability, maintain desirable emergent plant growth and invertebrate populations. Activities will include monitoring and adjusting wetland water levels year round with special emphasis during fall and spring migration peaks.

Strategy 2. Utilize moist soil and marsh management methods to enhance habitat diversity and waterfowl foraging opportunities through ground disturbance (summer disking) to encourage annual food plant production. Activities will entail drawdown and drying, on an annual or longer term interval coupled with vegetation and soil disturbance using burning, disking, planting, herbicides, mowing and plowing.

Strategy 3. Utilize integrated pest management to control invasive plant species, focusing on noxious weeds. Activities will entail monitoring, searching for and treating infestations utilizing best management practices and techniques. Invasive plant species, abundance, and distribution will be monitored as well as successfully treated acreage. Acreages will be determined by either visual estimation or GIS mapping.

Strategy 4. Explore the use of a program similar to the USFWS Cooperative Farming Program presently being used on the Lower Klamath Refuge of the Klamath Basin National Wildlife Refuge (KBNWR) Complex.

Strategy 5. Annual monitoring of seasonally flooded permanent wetlands will include comparing the acreage targets in Objective 2.2 with the acreages attained in the above strategies. Monitoring will be by HMU or other geographic or administrative boundary. Acreages will also be determined by either visual estimation or GIS mapping.

Objective 2.3: Enhance, manage and protect approximately 278 acres of palustrine intermittently flooded wetlands (alkali flats).

Rationale
Flooding exposed alkali playas in spring months with subsequent maintenance of water at depths less than six inches for several months provides breeding habitat for two key shorebird species at KWA; American avocet and black-necked stilt. Spring flooding also creates foraging conditions for spring migrating shorebirds and waterfowl. Subsequent late summer and fall evaporation events make invertebrate foods available to fall migrants.

Strategy 1. Regulate water (irrigation overflow) to provide timely flooding and receding levels to improve food availability, maintain emergent plant growth and invertebrate populations.

Strategy 2. Annual monitoring of alkali flats will include comparing the acreage targets in Objective 2.3 with the acreages attained in the above strategies. Monitoring will be by HMU or other geographic or administrative boundary. Acreages will also be determined by either visual estimation or GIS mapping.

Objective 2.4: Maintain approximately 583 acres of lacustrine permanently flooded wetland habitats on Shoalwater Bay and Sesti Tgawaals Point units. Emphasis will be on maintaining productive stands of submerged aquatic vegetation such as sago pondweed.

Rationale
This habitat type is important to diving ducks during migration periods as well as a wide variety of waterbirds such as grebes, terns and waders throughout the breeding and migration seasons. Submerged aquatic plants generally fill the entire water column and harbor immense and diverse populations of invertebrates. Stable water levels are important for the maintenance of fish and some invertebrate species.

Strategy 1. Monitor condition of wetland habitat and determine if any management (burning) would be necessary to reduce decadent vegetation.

Strategy 2. Annual monitoring of lacustrine permanently flooded wetlands will include comparing the acreage targets in Objective 2.4 with the acreages attained in the above strategy. Monitoring will be by HMU or other geographic or administrative boundary. Acreages will also be determined by either visual estimation or GIS mapping.

Objective 2.5: Protect and enhance approximately 155 acres of riverine wetlands on Gorr Island Unit with a ratio of robust emergent vegetation (dominated by cattails and bulrushes) to open water of no greater than 3:1. These wetlands should have open water with interspersed stands of vegetation to create a mosaic of habitat features within the unit. Water depths will be dependent on the existing depth of the Klamath River.

Rationale
A wide variety of migrant bird species take advantage of the diversity of food resources in these wetlands. Diving ducks and swans utilize open water areas to forage on submergent aquatic plants. Arctic nesting geese make extensive use of American three square and alkali bulrush roots and tubers during migration. Seeds from both annual and perennial plants provide an abundant source of food to a wide variety of migrants as well as breeding species.

This habitat type is important for many species of breeding waterbirds including ducks, geese, waders, secretive marsh birds, colonial nesting waterbirds and wetland dependent passerines. Robust emergent vegetation provides nesting substrate for many species and cover for broods and molting waterfowl. Open water areas with

submerged aquatic bed vegetation provide important foraging areas for all species, especially broods. Small fish, aquatic and emergent insects and other invertebrates provide additional food for migrating and breeding waterbirds.

Strategy 1. Monitor spring goose usage on the Gorr Island Unit relative to burning decadent emergent vegetation to provide a spring green forage component.

Strategy 2. Monitor vegetative species and inter-seed if necessary to reduce invasive plants.

Strategy 3. Utilize integrated pest management to control invasive plant species, focusing on noxious weeds within and adjacent to wetland areas. Activities will entail monitoring, searching for and treating infestations utilizing best management practices and techniques.

Strategy 4. Annual monitoring of riverine wetlands will include comparing the acreage targets in Objective 2.5 with the acreages attained in the above strategies. Monitoring will be by HMU or other geographic or administrative boundary. Acreages will also be determined by either visual estimation or GIS mapping.

Objective 2.6: Maintain and improve critical physical and functional infrastructure affecting wetland management activities.

Rationale
Physical infrastructure is essential for water level management and subsequential habitat management across all wetland habitats. Such infrastructure includes dikes, levees, culverts, flashboard risers, other water control structures and rock spillways. Functional infrastructure is necessary for water delivery for flood and drainage purposes and includes canals, channels and ditches.

Most wetland habitat objective and strategies rely on effective, efficient and timely water level manipulations. This capability is critical and necessary to affect nearly all habitat enhancement and management actions.

Vegetation response and subsequent desired wildlife use are tied to water levels, more specifically to the timing of drawdowns and flooding. Infrastructure maintenance and improvement will ultimately enhance and improve wetland condition and function. These actions will assist in meeting direction and goals of Intermountain West Joint Venture, Pacific Flyway species population management, and other state, local or federal agency implementation plans involving wetland management and protection. Coordination with appropriate agencies and organizations will occur.

Strategy 1. Maintain and improve physical infrastructure through annual maintenance. Work will include using heavy equipment to stabilize and repair erosion damage, repair burrowing rodent damage on dikes and levees, replace and repair flashboard riser structures, grade dike tops and mow vegetation. Culverts,

flashboard risers and other water control structures will be repaired, replaced and improved as necessary.

Strategy 2. Maintain and improve functional infrastructure through annual maintenance of canals, channels, ditches and water control structures. Activities will include using heavy equipment to remove accumulated silt and invasive vegetation, monitoring water flows/distribution and removing debris and obstructions in canals, channels, ditches and at water control structures.

Strategy 3. Redesign flashboard riser and culvert locations in areas as appropriate to improve drainage and flooding of wetland units. Activities will include using heavy equipment to install additional or relocate existing structures.

Strategy 4. Monitor facility infrastructure and equipment on an annual basis to determine a priority list of maintenance or development issues. The list will be separated into capital improvements, capital purchases, and deferred maintenance.

Goal 3: To provide a variety of wildlife oriented recreational and educational opportunities to the public that are compatible with Goals 1 and 2.

The Department and KWA staff strives to balance biological needs of fish and wildlife that use the area's habitats with the varied recreational and educational desires of the public. In order to meet habitat management objectives, however, decisions must be made to control public uses, either temporally or spatially, to minimize impacts to wildlife. Annual review of the area's hunt program and regulations, maintenance of safety zones, limiting vehicle access, maintaining parking areas and roads, posting signs and developing informational literature are among many of the strategies described below which support and encourage recreational objectives.

Objective 3.1: Provide hunting, trapping, and angling opportunities in a manner compatible with habitat management objectives.

Rationale
KWA is funded almost entirely by hunter dollars through the Federal Aid to Wildlife Restoration Act (Pittman Robertson) (74.25%) and hunting license receipts (24.75%). Hunting is a major public activity at KWA during fall through winter months.

KWA's public use program provides a diversity of opportunities and aesthetic benefits that are very important to preserve the hunting, angling and trapping opportunities for future generations of Oregonians. Appropriate hunter behavior and shooting effectiveness by all area users are critical to the hunting experience and equitable use and enjoyment of hunting resources. A regulated hunt program went into effect in 1984 as a result of hunters requesting a higher quality hunting experience. Previous to the development of the program, opening weekend would see 2,000 hunters on 2,400 acres of Miller Island Unit. The regulated hunt program has had some minor adjustments since its inception, but remains popular with the majority of hunters. Habitat

management objectives may necessitate the need to reduce hunter numbers when large-sized habitat management units are taken out of production for habitat enhancement activities.

Trapping of furbearers and predatory mammals is a traditional recreational activity, and is used to reduce burrowing damage to dikes and water control structures and manage populations of predatory mammals on KWA

Strategy 1. Continue daily hunt programs that include mourning dove, snipe, coot, pheasant (youth upland bird and general upland game bird seasons), quail, and waterfowl hunting (youth waterfowl and general duck and goose hunting seasons). Activities will include providing recommendations to headquarters staff on an annual basis regarding seasons, program opportunities and procedures.

Strategy 2. Maintain access roads, parking areas, informational kiosks, hunter check station, fencing and boat access sites as part of the hunt program.

Strategy 3. Conduct waterfowl counts and monitor wildlife population levels, distribution, and use patterns. Maintain database for comparative analysis. Report results to staff and provide information to KWA users. Activities include weekly counts, data analysis and recording, reporting results via the department web-site and posting hard copies at the Area's check station.

Strategy 4. Expand hunter education and informational programs to improve hunter behavior and effectiveness. Work will include participation in The Cooperative North American Shotgunning Education Program (CONSEP), providing shotgun skill clinics and field contacts by department and OSP personnel. Activities will include providing information regarding shooting skills and distance estimation verbally through hunter contacts, on kiosks, and in the Headquarters Complex.

Strategy 5. Develop regulatory approaches to address persistent hunter behavior and effectiveness problems through revocation of daily hunting permits. Activities include development of Administrative Rules, procedures and dissemination of information to KWA users.

Strategy 6. Continue to provide access and area information to the public through web page postings, brochures, maps, signing and hunting regulation booklets.

Strategy 7. Maintain and improve KWA's Americans with Disabilities Act (ADA) accessible hunting program.

Strategy 8. Continue hunter permit system for tracking hunter use and success on the wildlife area. Annually monitor hunting use of the area to review and possibly revise wildlife area hunting regulations to enhance the quality and safety of the hunting program.

Strategy 9. Develop and maintain relationships with hunting constituent groups and organizations to assist with wildlife area management.

Strategy 10. Continue to conduct furbearer and predatory mammal trapping by permit for administrative (damage control), biological (population management) and recreational purposes.

Strategy 11. Periodically translocate desirable game (e.g. ring-necked pheasants) and native (California quail) wildlife to KWA to augment existing populations and hunting opportunities.

Strategy 12. Develop methodology to monitor hunter use on the three remote wildlife area management units.

Objective 3.2: Provide wildlife viewing and education/interpretation opportunities compatible with Objective 3.1.

Wildlife viewing related recreation and education activities constitute a large portion of the public's use of the area. These activities are highly desired by the public and demand is increasing. The Department's mission is to protect Oregon's fish and wildlife and their habitats for use and enjoyment by present and future generations. Wildlife viewing use must be managed to assure compatibility with Goals 1 and 2. Increased educational and informational efforts will enhance enjoyment while affording protection for the resource. KWA will seek to expand opportunities for interpretation and environmental education that will foster visitors' appreciation, understanding, and stewardship of the wildlife area's fish and wildlife species and their associated habitats. Currently, KWA is maintained entirely by funds generated from hunters, through Federal Aid and hunting license revenue. In order to meet continued maintenance needs it will be necessary to explore additional funding or support sources. Methods to estimate the number and identify the origin of KWA users will be developed.

Strategy 1. Maintain existing public facilities during the non-hunting period to provide opportunities for wildlife viewing related users. Activities include maintenance of viewing blinds, kiosks, roads, parking areas and posting signs.

Strategy 2. Continue to provide wildlife area information to the public through web page postings, weekly recreational reports, other media publications, bird checklists, brochures, maps, regulations, and species backgrounders.

Strategy 3. Maintain Host/Volunteer program to maintain and enhance the wildlife viewing use program and other wildlife area needs.

Strategy 4. Provide guidance and support to educational institutions including school, civic groups, conservation entities and state/federal agencies.

Strategy 5. Develop process to monitor public use. Methodology will be developed for various portions of KWA to more accurately document public uses and the origin of area users.

Strategy 6. Manage wildlife viewing related use consistent with the biological needs of wildlife and the wildlife area's hunting program.

Strategy 7. Expand internship programs with colleges and universities to support education, management, inventory and monitoring needs.

Strategy 8. Continue conservation, educational and informational programs involving habitat and population management for selected wildlife species in conjunction with other state and federal conservation efforts.

Strategy 9. Monitor wildlife viewing related use on the wildlife area by utilizing car counters on Miller Island and development of a voluntary use permit. Estimate use levels on an annual basis based on activity (bird watching, hiking, picnicking, etc.).

Plan Implementation

Funding

Since its inception in 1954, funding for operation and maintenance of KWA has been accomplished through annual federal grant agreements under the Federal Aid to Wildlife Restoration (WR) Program. This program was created with the passage of the Pittman- Robertson (PR) Act in 1937. The PR Act authorizes the USFWS to cooperate with the States, through their respective State fish and wildlife departments, to fund wildlife restoration projects. Eligible types of projects include restoration, conservation, management, and enhancement of wild birds, wild mammals and their habitats, and providing for public use and benefit from these resources.

Funding for WR is derived from a federal excise tax on the sale of firearms, ammunition, and archery equipment. Funding is then apportioned to states based on a mathematical formula of area of the state in square miles (50%) and total number of hunting licenses sold annually (50%). Under the program no state may receive more than 5%, nor less than 0.5% of the total money available.

To be eligible, States must have consented to the provisions of the PR Act and passed laws for the conservation of wildlife that include a prohibition against the diversion of license fees paid by hunters for any other purpose than the administration of the State fish and wildlife department. Another major requirement is that states have to contribute up to 25% of the total grant cost using non-federal funds, since federal participation is limited to 75% of eligible costs incurred under a grant. The department provides its 25% cost share from annual license and tag revenues.

Over the past five years, funding for the operation and maintenance of the KWA has averaged approximately $332,330 annually. To implement many of the proposed actions and achieve the objectives and goals of this plan, the Department will need

additional funding and staff to undertake several types of projects including: upgrades of existing facilities, habitat improvements, construction of new facilities or amenities (educational/orientation kiosks and interpretive signs), and species and habitat monitoring.

Accomplishments

Since the 2008 KWA Management Plan review, there has been some major accomplishments that are summarized in this section:

The 1st and 2nd phase of the boat ramp improvement project was completed. Sport Fish Restoration, Access and Habitat Board and Oregon Marine Board funds were used in the development/enhancement of the boat ramp, parking lot and access road.

A 48'X64' equipment storage building and an adjacent 48'X32' enclosed equipment shop (48'X96' total building area) were built south of the office.

A major cleanup effort of the wildlife area facilities was initiated, including cleanup of, and graveling of equipment building, cleanup of woodshop and metal shop, cleanup of scrap metal and tearing down of an old shed.

The existing well at the headquarters area was abandoned and a new, 250 foot well was drilled, providing higher recharge/flow capabilities.

The manager's residence was completely remodeled and a significant drainage issue was fixed at the senior technician's house. Windows were replaced at both residences along with the office. New siding was put on the senior technician's house.

Parking areas, roads and dikes were graveled. Small kiosks were installed at parking areas. Large informational signs were developed and installed at the hunter checkstation, area headquarters, boat ramp and in an informational kiosk.

Several capital equipment purchases have occurred since 2008 to replace aging equipment including: two tractors, a backhoe, grain drill, UTV, traveling water reel, wheel line and mobile diesel irrigation pump.

Four electrical water pumps and sumps were replaced and installed to help with water management on the wildlife area.

A large scale wetland enhancement project was initiated, area surveys, engineering plans and cultural surveys have been completed to date. 472 acres of the Delameter, Hamaker and Hooper Lowlands HMU will have dikes repaired/rebuilt, water control infrastructure replaced and improvements to water conveyance into and out of units.

The statewide wildlife area parking permit program was initiated at KWA in 2013.

Field visitor use surveys for a yearlong public use study, including economic information was conducted, as well as vehicle traffic counters. Results of that project are not yet available.

Hunting and trapping programs were conducted annually. Changes to the hunting program occurred to simplify regulations and provide better hunting opportunities. Changed from hunt days of every other day with 1:00 pm closure and Unit C re-opening till the end of shooting times to hunt days: every Monday, Wednesday and Saturday, open all day.

Staffing/Organization

The department manages 17 major wildlife areas throughout the state. The wildlife areas encompass approximately 200,000 acres and are found in all four Department administrative regions. KWA is located in the High Desert Region. One full-time Manager 1, one part-time Fish and Wildlife Senior Technician, and one 3 month seasonal Technician currently staff KWA.

Compliance Requirements

The KWA Management Plan was developed to comply with all Federal and State laws, Oregon Revised Statutes (ORS), Oregon Administrative Rules (OAR), and Department policies. Full implementation of all components of this plan will require compliance with laws, regulations, rules, and policies listed in Appendix F.

Partnerships

A number of other state, federal, and local agencies and interest groups assist with management activities on KWA. These partners play an important role in helping the department achieve its mission and attain KWA goals. The Department will continue to rely on these and other partners in the future to help implement this plan and provide input for future updates. This plan identifies projects that provide new opportunities for existing or new partners. There is great potential for more public participation and assistance in management of KWA, given its proximity to population centers such as Klamath Falls, Medford and Lakeview. The Department welcomes and encourages more public participation in the administration of KWA.

Cooperative projects will be undertaken with other agencies and Non-governmental Organizations (NGOs) as opportunities exist for the mutual benefit of wildlife or their habitats.

Historic cooperative projects and cooperators include:

- Noxious weed control – Klamath County Weed Control District and Klamath County Soil and Water Conservation District.

-Goose capture and banding – USFWS Klamath Basin Refuges

-Avian Influenza Sampling – USFWS Klamath Basin Refuges

- Boat ramp parking and access improvements – Oregon Marine Board, Sport Fish Restoration and the Department's Access and Habitat Board

- Wetland habitat enhancement – Ducks Unlimited, Bureau or Reclamation, USFWS, Intermountain West Joint Venture, Oregon Watershed Enhancement Board.

- Dike maintenance – City of Klamath Falls

The Department has been involved with the Klamath Refuge Complex Comprehensive Conservation Plan (CCP) process. Flyway management of waterfowl is coordinated with the California Department of Fish and Game, USFWS, and others through the Pacific Flyway Council.

Adaptive Management

This plan provides for adaptive management of KWA. Adaptive management is a flexible approach to long-term management of resources that is directed by the results of ongoing monitoring activities and latest data. Management techniques and strategies are regularly evaluated in light of monitoring results, new scientific understanding, and other new information. These periodic evaluations are used over time to adapt both management techniques and strategies to better achieve the Wildlife Area goals.

Monitoring is an essential component of adaptive management in general, and of this plan in particular; specific monitoring strategies have been integrated into goals and objectives described in this plan whenever possible. Habitat management activities will be monitored where possible to assess whether the desired effects on wildlife and habitat components have been achieved.

Plan Amendment and Revision

Wildlife area management plans are meant to evolve with each individual wildlife area, and as such each plan will be formally revisited after 5 years and updated every 10 years. In the meantime, however, the Department will be reviewing and updating this plan periodically (at least as often as every 5 years) based on the results of the adaptive management program. This plan will also be informally reviewed by KWA staff while preparing annual work plans. It may also be reviewed during routine inspections or programmatic evaluations. Results of any or all of these reviews may indicate a need to modify the plan. Goals and objectives described in this plan will not change until they are re-evaluated as part of the formal plan revision process. However, strategies may be revised to better address changing circumstances or due to increased knowledge of the resources on KWA. If changes are required, the level of public involvement and associated compliance requirements will be determined by the Department.

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Appendix A. Land Acquisitions and Adjustments Involving the Klamath Wildlife Area

Date	Acres	Action	Cooperator	Location
1951	1,240.8	Purchase	COPCO	Shoalwater Bay
1953	143.5	Purchase	Hilda Mustonen	Sesti Tgawaals Pt.
1953	161.5	Purchase	Hilda Mustonen	Gorr Island
1953	115.5	Purchase	Almond Gregory	Miller Island
1954	66.4	Purchase	Almond Gregory	Miller Island
1954	72.3	Purchase	Odis George	Miller Island
1954	91.3	Purchase	S.L. Rayson	Miller Island
1954	271.4	Purchase	Abe Boehm	Miller Island
1954 and 1966	623.1	Purchase	J. C. Hooper	Miller Island
1957	283.7	Purchase	B. B. Hooper	Miller Island
1958	210.6	Purchase	H. B. Largent	Miller Island
1963	137.9	Purchase	Homer DeLameter	Miller Island
1967	353.9	Purchase	H. B. Largent	Miller Island
1968	234.8	Purchase	H. E. Hamaker	Miller Island
1991	1.5	Donation	John Furman	Miller Island
1992	2.2	Donation	Patricia Costello	Miller Island
1996	37	Donation	Weyerhaeuser Co.	Sesti Tgawaals Pt.
	Sum WMA		4,047.4	
	Less 635 acres sold[1]		-635.0	
	Total WMA		**3,412.4**	

[1] 635 acres along Shoalwater Bay were sold to Klamath County

Appendix B. Plant Species Known to Occur on Klamath Wildlife Area

Conifer trees
Ponderosa pine (*Pinus ponderosa)*
Western white pine *(Pinus monticola)*
Western juniper *(Juniperus occidentalis)*
Common juniper *(Juniperus communis)*

Hardwood trees
Lombardy poplar (*Populus nigra*)

BIGNONIACEAE
Siberian elm (*Ulmus pumila*)

ULMACEAE
Apple (*Malus spp.*)
Pear (*Pyrus spp.*)
Cherry (*Prunus spp.*)
Apricot (*Prunus spp*.)
Peach *(Prunus persica)*
Plum (*Prunus spp*.)
Black cottonwood *(Populus trichocarpa)*

Shrubs
Lilac *(Syringa vulgaris)*
Blackberry *(Rubus spp.)*
Western dogwood *(Cornus stolonifera)*

ALISMATACEAE
Water Plantain *(Alisma plantago aquatica L.)*

AELUROPODEAE
Inland saltgrass (*Distichlis spicata*)

ANACARDIACEAE
Skunkbush sumac (*Rhus aromatica)*

APIACEAE
Poison hemlock (*Conium maculatum* L.)
Water hemlock (*Cicuta douglasii*)
Water parsnip (*Berula erecta huds*.)

Asparagaceae
Asparagus *(Asparagus afficinalis)*

ASTERACEAE
Devil's beggartick (*Bidens frondosa L.*)
Basin big sagebrush (*Artemisia tridentate*)
Bull thistle (*Circium vulgare*)
California malacotherix (*Malacotherix calif*.)
Canada thistle (*Circium arvense*)
Coast tarweed *(Madia sativa)*
Common burdock (*Arctium minus)*
Common cocklebur *(Xanthium strumarium)*
Common dandelion (*Taraxicum officianale*)
Field camomile (*Anthemis arevensis*)
Gray rabbitbrush (*Chrysothamnus nauseosus*)
Great Basin goldenrod (*Solidago spectabilis*)
Greater swamp senecio (*Senecio hydrophilus Nutt*.)
Western groundsel (*Senecio intergerrimus*)
Gum plant (*Grindelia nana*)
Hall's aster (*Aster chilensis ssp. Halli Nees*.)
Hawksbeard (*Crepis spp*.)
Hoary chaentactis (*Chaenactis douglaasii. var achilleafolia*)
Horseweed (*Conyza canadensis Cron*.)
Intermountain pyrrocoma (*Pyrrocoma lanceolata*)
Lance-leaved Microsis (*Microseris lancinata Shultz*)
Low everlasting (*Antennaria dimorpha Nutt*.)
Low meadow erigeron (*Erigeron loncchophyllus Hook*.)
Marsh aster (*Aster lanceolatus, ssp. Hesperius Gray*.)

Musk thistle (*Carduus nutans*)
Pineappleweed *(Matricaria matricarioides)*
Prickly lettuce (*Lactuca serriola*)
Prickly sow thistle (*Sonchus asper L*.)
Purple aster *(Machaeranthera canescens)*
Rayless alkali aster (*Aster brachyactis Blake*)
Scotch thistle (*Onopordum acanthium*)
Small flowered daisies (*Erigeron spp*.)
Spike weed (*Latia/ Hemizonia spp*.)
Spiny hop sage (*Artemesia spinescens D.C. Eat*.)
Spiney horse brush (*Tetrademia spinosa*)
Tall stephanomeria (*Stephanomeria virgata*)
Torrey's malacothrix (*Malacothrix torreyii*)
Western goldenrod (*Solidago occidentalis*)
Western salsify *(Tragopogon dubius)*
Wild sunflower (*Helianthus annuus*)
Wooly sunflower (*Eriphyllum lanatum*)
Yarrow (*Achillea millefolium* L.)
Yellow goats beard (*Tragopogon major*)
Yellow starthistle *(Cenaurea solstitialis)*

ASCLEPIADACEAE
Showy milkweed (*Asclepias speciosa*)

AVENEAE
Timothy (*Phleum pretense*)

BERBERIDACEAE
Tall Oregon-grape *(Berberis aquifolium)*

BETULACEAE
Water birch (*Betula occidentalis*)

BORAGINACEAE
Bristly pectocarya (*Pectocarya setosa Gray*.)
California heliotrope (*Heliotropium canvolulaceum var. Calif*.)
Hen's tooth *(Lithopermum ruderale)*
Seaside fiddle-neck *(Amsinckia intermedia)*
Small forget-me-not (*Myosotis laxa*)
Small fiddle neck (*Amsinckia intermedia*)
Western gromwell (*Litospermum ruderale Dougl*.)

BRASSICACEAE
Bladder-pod (*Lesquerlla spp*.)
Blue mustard (*Chorispora tenella DC*.)
Clasping pepperweed (*Lepidium perfoliatium*)
Crisped thelypodium (*Thelypodium crispum*)
Dames Rocket (*Hesperis matronalis*)
False flax (*Camelina microcarpa Andrz.)*
Flixweed (*Descrainia Sophia webb*.)
Horseradish *(Armoracia rusticana)*
Nevada tansy mustard (*Descurinia paradise Shultz*.)
Penny cress (*Thlaspe arvense L*.)
Perennial thelypodium (*Thelypodium flexuosum Robbins*.)
Perennial pepperweed (*Lepidium latifolium*)
Tumble mustard (*Sisymbrium altissimum*)
Vernal whitlow grass (*Draba verna L*.)
Yellow cress (*Rorippa obtuse Nutt*.)
Yellow pepper grass (*Lepidium perfoliaum L.)*

CAPPARACEAE
Tall bee plant (*Cleome lutea*)

CAPRIFOLIACEAE
Bush honeysuckle (*Lonicera involucrate*)

CHENOPODIACEAE
Black greasewood (*Sarcobatusvermiculatus*)
Fourwing saltbush (*Atriplex canascens*)
Kochia (*Kochia scoparia*)

Lamb's quarters (*Chenopodium strictum*)
Nuttall's monoepis (*Monopelis nuttalliana)*
Nuttall's saltbrush (*Atriplex nuttallii*)
Red goose foot (*Chenopodium rubrum*)
Red monolepis (*Monolepis pusilla*)
Shad scale saltbush (*Atriplex confertifolia*)
SpinyHop sage (*Grayia spinosa*)
Tumbleweed (*Salsola tragus)*

CHLORIDEAE
Sloughgrass, Cordgrass (*Spartina pectinata*)

CHLOROPHYCEAE
Green algae

CONVOLVULAEAE
Field bindweed (*Convolvulus arvensis*)

CORNACEAE
Western red dogwood (*Cornus californica*)

CYPERACEAE
Broad-leaved cattail *(Typa latifolia)*
Narrow-leaved cattail *(Typha anguistifolia*)
Hardstem bulrush (*Scirpus acutus*)
Softstem bulrush *(Scirpus validus)*
River bulrush *(Scirpus olenyi)*
Alkali bulrush (*Scirpus paludosus*)
American three-square bulrush (*Scirpus americanus*)
Small-seed bulrush *(Scirpus microcarpus*)
Seaside arrowgrass (*Triglochin maritime*)
Creeping spikerush (*Eleocharis palustris*)
Beaked spikerush (*Eleocharis rostellata*)
Grummond's rush (*Juncus drummondii*)
Baltic rush (*Juncus balticus*)
Nevada bulrush (*Scirpus nevadensis*)
Sedge (*Carex spp*.)
Sedge (*Carex aboriginum*)
Sedge (*Cyperus spp*.)

DIPSACACEAE
Common teasel (*Dipsacus sylvestris*)
Cutleaf teasel *(Dipsacus laciniatus* L.)

EUPHORBIACEAE
Ridge–seeded spurge (*Euphorbiaceae glyptosperma*)

ELAEGNACEAE
Russian olive (*Elaegnus angustifolius*)

ERAGROSTEAE
Alkali sacaton (*Sporobolus airoides*)

FABACEAE
Alfalfa (*Medicago sativa*)
Applegate's milkvetch (*Astragalus applegatei*)
Aslike clover (*Trifolium hybridum*)
Honey locust (*Robinia pseudo-acacia*)
Hop clover (*Trifolium procumbens*)
Siberian pea shrub (*Caragana arborescens*)
White sweet clover (*Melilotus alba*)
Yellow sweet clover (*Melilotis officinalis*)
Rose clover *(Trifolium hirtum)*
Subterranean clover *(Trifolium subterranean)*
Elegant lupine *(Lupinus lepidus)*
Bicolor lupine *(Lupinus bicolor)*
Hairy vetch *(Vicia villosa)*

GERANIACEAE
Red-stem filaree or stork's bill (*Erodium cicutarium)*

GROSSULARIACEAE
Golden currant (*Ribes aureum*)

HALORAGIDACEAE
Mare's tail (*Hippuris vulgaris*)
Water milfoil (*Myriophyllum spp*.)

HYDRANGEACEAE
Mock orange *(Philadelphus lewisii)*

HYDROPHYLLACEAE
Narrow leaf phacelia (*Phacelia linearis*)
Varied leaf phacelia (*Phacelia heterophylla*)

IRIDACEAEWild iris (*Iris missouriensis*)
Yellow flag (*Iris pseudacorus*)

JUNCAGINACEAE
Seaside arrow grass (*Triglochin maritime*)

LAMIACEAE
Horehound (*Marrubium vulgare*)
Mediterranean sage (*Salvia aethiopis*)
Peppermint (*Mentha piperita*)
Self-heal *(Prunella vulgaris)*
Water horehound (*Lycopus lucidus*)

LEMNACEAE
Duckweed *(Lemna minor)*

LILIACEAE
Cats ear (*Callochortus lyallii*)
Sand lily (*Leucocrinum montanum)*

LINACEAE
Blue flax (*Linum spp.)*
Western flax *(Linum lewisii)*

LOASACEAE
Blazing star (*Mentzelia laevicaulis*)

MALVACEAE
Common mallow (*Malvia neglecta*)
Round leaved mallow (*Malva pusilla*)

ONAGRACEAE
Pallid epilobium (*Boisduvalia pallidum*)
Small flower evening primrose (*Camissonia minor*)
Tansy leaved evening primrose (*Oenothera tanacetifolia*)
Willow herb (*Epilobium spp.*)

PAPAVERACEAE
Poppy (*Argemone spp*.)

POACEAE
Cheatgrass *(Bromus tectorum)*
Bulbous blue grass (*Poa bulbosa*)
Common reed or phragmites (*Phragmites communis)*
Green Fescue (*Festuca viridula*)
Salt grass (*Distichlis spicata*)
Sandburg bluegrass *Poa secunda)*
Meadow foxtail (*Alapecurus pratensis*)
Smooth brome (*Bromus inermis*)
Perennial ryegrass (*Lolium perenne*)
Medusahead rye (Taeniatherum canput-medusaea)
Ripgut brome *(Bromus rigidus)*
Orchardgrass (*Dactylis glomerata*)
Witch grass (*Panicum capillare*)
Reed canarygrass *(Phalaris arundinacea)*
Barnyardgrass *(Echinochloa crus-galli)*
Tufted hairgrass *(Deschampsia cespitosa)*
California oatgrass *(Danthonia californica)*
Swamp timothy *(Crypsis schoenoides)*
Tall wheat grass (*Thinopyrum ponticum*)
Lemmon's needlegrass *(Acnatherum lemmonii)*
Idaho fescue *(Festuca idahoensis)*
Tall fescue *(Festuca spp)*
Great basin wild rye (*Leymus cinerus*)

POTAMOGETONACEAE
Curly pondweed (Potomogeton crispus)
Fennel-leaf or Sago pondweed (*Potamogeton pectinatus*)
Floating pondweed (*Potamogeton natans)*
Horned pondweed (*Zannichellia palustris*)

POLYGONACEAE
Curly dock (*Rumex crispus)*
Erect knotweed (*Polygonum erectum*)
Red sorrel (*Rumex acetosella*)
Spotted ladysthumb (Polygonum pericaria L.)
Water smartweed (*Polygonum amphibium*)
Western dock (*Rumex occidentalis*)
Wire stem erigonum (*Eriogonum vimineum*)

POLYMONIACEAE
Long-leaved phlox (*Phlox longiflolia*)
Spotted persicarya (*Polygonum perisicarya*)
Trailing phlox *(Phlox adsurgens)*

RANUNCULACEAE
Bur buttercup (*Ranunculus testivulatus*)
Barren-ground larkspur (*Delphinium depaupertum*)
White water buttercup (*Ranunculus aquatilis*)

ROSACEAE
Antelope bitterbrush (*Purshia tridentate*)
Common chokecherry *(Prunus virginiana)*
Common wild rose *(Rosa nutkana)*
Curlleaf mountain mahogany (*Cercocarpus ledifolius*)
Oregon crab apple (*Malus fusca*)
Silver weed (*Potentilla anserina)*
Small burnett (*Sanguissorba* spp.)
Utah service berry (*Amelanchoir utahensis*)
Woods rose (*Rosa gymnocarpa*)

RUBIACEAE
Catchweed bedstraw (*Galium aparine*)

SALICACEAE
Golden willow (*Salix alba*)
Narrow leafed willow *(Salix exigua)*
Pacific black willow *(Salix lucida lasiandra)*

SCROPHULARIACEAE
American speedwell (*Veronica americana*)
Water speedwell (Veronica anagallis-aquatica L.)
Butterfly bush (*Buddleja sp*.)
Common mullein (*Verbacum thapsus*)
Common monkeyflower (Mimulus guttatus)
Small flowered collinsia (*Collinsia parviflora*)

SOLANA
Matrimony vine (*Lycium barbarum*)

SOLANACEAE
Buffalobur nightshade (*Solanum rostratum*)
Black nightshade *(Solanum nigrum)*

Sparganiaceae
Narrowleaf bur-reed *(Sparganium angustifolium)*

STIPEAE
Indian ricegrass (*Oryzopis hymenoides*)

TAMARICACEAE
Salt Cedar *(Tamarix aphylla)*

TRITICEAE
Creeping wildrye (*Elymus triticoides*)
Crested wheatgrass (*Agropyron cristatum*)
Foxtail barley (*Hordeum jubatum*)
Barley (*Hordeum vulgare*)
Basin wild-rye (*Elymus cinereus*)
Mediterranean barley *(Hordeum marinum)*
Medusahead rye *(Taeniatherum caput-medusae)*

Beardless wheatgrass (*Agropyron inermis*)
Elmers wheatgrass (*Agropyron elmeri*)
Perennial ryegrass (*Lolium perenne*)
Cereal rye (*Secale cereale*
Wheat (*Triticum aestium*)
Bluebunch wheatgrass *(Agropyron spicatum)*
Largo tall wheatgrass *(Agropyron elongatum)*
Alkali muhlenbergia (*Muhlenbergia asperifolia*)
Lemmons alkaligrass (*Puccinella spp*.)
Triticale (*x. Triticosecale*)

VIOLACEAE
Northern bog violet (*Viola nephrophlla*)

ZYGOPHYLLACEAE
Puncture vine (*Tribulus terrestris*)

Appendix C. Wildlife Species Known to Occur on KWA

Occurrence: Abundant = a, Common = c, Uncommon = u, Rare = r
Symbols Used
Sp Spring; March-June
S Summer; July-September
F Fall; October-December
W Winter; January-February (I) Introduced species
* Nests in area

	Seasonal Abundance			
Amphibians	**Sp**	**S**	**F**	**W**
Western toad *(Bufo boreas)*	u	u	u	
Pacific treefrog *(Pseudacris regilla)*	u	u	u	u
Bullfrog (I) *(Rana catesbeiana)*	c	c	c	
Reptiles				
Sagebrush lizard *(Sceloporus graciosus)*	u	u	u	
Western skink *(Eumeces skiltonianus)*	c	c	c	
Rubber boa *(Charina bottae)*	c	c	c	
Western racer *(Coluber mormon)*	u	u	u	
Ringneck snake *(Diadophis punctatus)*	u	u	u	
Common garter snake *(Thamnophis sirtalis)*	c	c	c	
Common gopher snake *(Pituophis catenifer)*				
Western terrestrial garter snake *(Thamnophis elegans)*	c	c	c	
Western pond turtle *(Clemmys marmorata)*	c	c	c	
Short-horned lizard *(Phrynosoma douglassii)*	u	u	u	
Western fence lizard *(Sceloporus occidentalis)*	u	u	u	
Mammals				
Black-tailed deer *(Odocoileus hemionus columbianus)*		c		
Rocky Mountain elk *(Cervus elaphus nelsoni)*	r	r	r	r
Mule deer *(Odocoileus hemionus hemionus)*	u	o	o	u
Pronghorn *(Antilocapra americana)*	r	r		
Coyote *(Canis latrans)*	c	c	c	c
Common gray fox *(Urocyon cinereoargenteus)*	u	u		u
Red fox *(Vulpes vulpes)*	u	u	u	u
Striped skunk *(Mephitis mephitis)*	c	c	c	c
Western spotted skunk *(Spilogale gracilis)*	u	u	u	u

Mammals	**Sp**	**S**	**F**	**W**
Northern Raccoon *(Procyon lotor)*	c	c	c	c
Bobcat *(Lynx rufus)*	u	u	u	u
Beaver *(Castor canadensis)*	u	u	u	u
Northern river otter *(Lontra canadensis)*	c	c	c	c
Muskrat *(Ondatra zibethicus)*	a	a	a	c
American mink *(Mustela vison)*	c	c	c	c
Long-tailed weasel *(Mustela frenata)*	c	c	c	c
Black-tailed jackrabbit *(Lepus californicus)*	a	a	a	a
Mountain cottontail *(Sylvilagus nuttallii)*	c	c	c	c
American badger *(Taxidea taxus)*	r	r	r	
Yellow-bellied marmot *(Marmota flaviventris)*	c	c	c	u
California kangaroo rat *(Dipodomys californicus)*	u	u	u	u
Deer mouse *(Peromyscus maniculatus)*	c	c	c	c
House mouse (I) *(Mus musculus)*	c	c	c	c
Great Basin pocket mouse *(Perognathus parvus)*	u	u	u	
Belding's ground squirrel *(Spermophilus beldingi)*	c	u	c	u
Golden-mantled ground squirrel *(Spermophilus lateralis)*	c	u	c	u
Western gray squirrel *(Sciurus griseus)*	c	c	c	u
Douglas's squirrel *(Tamiasciurus douglasii)*	c	c	c	u
Western harvest mouse *(Reithrodontomys megalotis)*	c	c	c	u
Montane vole *(Microtus montanus)*	c	c	c	c
California ground squirrel *(Spermophilus beecheyi)*	a	a	a	
California myotis *(Myotis californicus)*	c	c	c	
Big brown bat *(Eptesicus fuscus)*	c	c		
Pallid bat *(Antrozous pallidus)*	c	c	c	u
Little brown myotis *(Myotis lucifugus)*	c	c		
Silver-haired bat *(Lasionycteris noctivagans)*	c	c		
Water shrew *(Sorex palustris)*	c	c	c	u
Vagrant shrew *(Sorex vagrans)*	c	c	c	
Bushy-tailed woodrat *(Neotoma cinerea)*	c	c	c	u
North American porcupine *(Erithizon dorsatum)*	c	c	c	c
Northern pocket gopher *(Thomomys talpoides)*	c	c	c	u
Broad-footed mole *(Scapanus latimanus)*	c	c	c	c

Birds	Sp	S	F	W
Loons, Grebes				
Common loon *(Gavia immer)*	r		r	
Pied-billed grebe * *(Podilymbus podiceps)*	c	c	c	c
Horned grebe *(Podiceps auritus)*			u	
Eared grebe *(Podiceps nigricollis)*	c	c	c	r
Western grebe *(Aechmorphorus occidentalis)*	c	c	c	r
Clark's grebe *(Aechmorphorus clarkii)*	u	u	u	r
Pelicans, Cormorants				
American white pelican *(Pelecanus erythrorhynchos)*	c	c	c	
Double-crested cormorant *(Phalocrocorax auritus)*	c	c	c	
Herons, Bitterns, Ibis				
American bittern * *(Botaurus lentiginosus)*	o	o	o	
Least bittern *(Ixobrychus exilis)*		r	r	
Great blue heron *(Ardea herodias)*	c	c	c	c
Green heron *(Butorides virescens)*	u	u	u	
Great egret *(Ardea alba)*	c	c	c	
Cattle egret *(Bubulcus ibis)*		r		
Snowy egret *(Egretta thula)*		u		
White-faced ibis *(Plegadis chihi)*	c	c	u	
Black-crowned night heron *(Nycticorax nycticorax)*	c	c	c	u
Waterfowl				
Tundra Swan *(Cygnus columbianus)*	c	u	c	c
Trumpeter Swan (*Cygnus buccinator*)	r			r
Greater white-fronted goose *(Anser albifrons)*	a	r	u	a
Lesser snow goose *(Chen caerulescens)*	a	r	u	a
Ross' goose *(Chen rossii)*	a	r	u	a
Lesser Canada goose *(Branta hutchinsii parvipes)*	u			u
Canada goose * *(Branta canadensis)*	c	c	c	c
Cacklinggoose *(Branta hutchinsii minima)*	u			u
Wood duck* *(Aix sponsa)*	u	u	u	
Green-winged teal *(Anas crecca)*	c	u	c	u
Northern pintail * *(Anas acuta)*	a	c	c	a

Birds	Sp	S	F	W
Waterfowl				
Mallard * *(Anas platyrhynchos)*	c	c	c	c
Blue-winged teal *(Anas discors)*	u	u		
Cinnamon teal * *(Anas cyanoptera)*	c	c	c	
Northern shoveler * *(Anas clypeata)*	c	u	c	u
Gadwall * *(Anas strepera)*	c	c	c	u
American wigeon *(Anas americana)*	a	u	c	a
Eurasion wigeon (*Anas penelope*)	u		u	
Canvasback * *(Aythya valisineria)*	c	u	c	c
Redhead * *(Aythya americana)*	c	c	c	r
Ring-necked duck *(Aythya collaris)*	c	u	c	c
Greater scaup *(Aythya marila)*	r		r	
Lesser scaup * *(Aythya affinis)*	c	u	c	c
Common goldeneye *(Bucephala clangula)*	u		u	c
Barrow's goldeneye *(Bucephala islandica)*			u	u
Bufflehead *(Bucephala albeola)*	c	u	c	c
Hooded merganser *(Lophodytes cucullatus)*	u		u	
Common merganser *(Mergus merganser)*	c	u	c	c
Ruddy duck * *(Oxyura jamiacensis)*	c	c	c	c
Birds of Prey				
Turkey vulture *(Cathartes aura)*	c	u	c	
Bald eagle* *(Haliaeetus leucocephalus)*	c	u	u	c
Golden eagle *(Aquila chrysaetos)*	u		u	u
Northern Harrier * *(Circus cyaneus)*	c	c	c	c
Sharp-shinned hawk *(Accipiter striatus)*	u		u	
Northern goshawk *(Accipiter gentilis)*				u
Cooper's hawk *(Accipiter cooperii)*	u		u	
Red-shouldered hawk *(Buteo lineatus)*			u	u
Swainson's hawk *(Buteo swainsoni)*	r		r	
Red-tailed hawk * *(Buteo jamaicensis)*	c	c	c	c
Ferruginous hawk *(Buteo regalis)*			u	u
Rough-legged hawk *(Buteo lagophus)*	u		u	u
Osprey *(Pandion haliaetus)*	r	r		
American kestrel * *(Falco sparverius)*	c	c	c	c

Birds	Sp	S	F	W
Birds of Prey				
Peregrine falcom (*Falco peregrinus*)	u		u	u
Prairie falcon *(Falco mexicanus)*	u	u	u	u
Merlin *(Falco columbarius)*	r		r	r
Grouse, Quail, Pheasants				
Chukar (I) *(Alectoris chukar)*	r	r	r	r
Ring-necked pheasant * (I) *(Phasianus colchicus)*	c	c	c	c
California quail * (I) *(Callipepla californica)*	c	c	c	c
Mountain quail (*Oreortyx pictus*)	u	u	u	u
Cranes, Rails, Coot				
Virginia rail * *(Rallus limicola)*	c	c	c	u
Sora * *(Porzana carolina)*	c	c	c	u
American coot * *(Fulica americana)*	c	c	c	c
Greater sandhill crane * *(Grus canadensis)*	c	c	c	
Shorebirds				
Snowy plover *(Charadrius alexandrinus)*			r	
Semipalmated plover *(Charadrius semipalmatus)*	u		u	
Killdeer * *(Charadrius vociferous)*	c	c	c	r
Black-necked stilt * *(Himantopus mexicanus)*	c	c	c	
American avocet * *(Recurvirostra americana)*	c	c	c	
Greater yellowlegs *(Tringa melanoleuca)*	c		c	r
Lesser yellowlegs *(Tringa flavipes)*	c		c	
Solitary sandpiper *(Tringa solitaria)*	u		u	
Willet * *(Catoptrophorus semipalmatus)*	u	c	u	
Spotted sandpiper * *(Actitis macularia)*	c	c	c	
Whimbrel *(Numenius phaeopus)*	r		r	
Long-billed curlew *(Numenius americanus)*	u		u	
Marbled godwit *(Limosa fedoa)*	u		u	
Western sandpiper *(Calidris mauri)*	c	c	u	
Least sandpiper *(Calidris minutilla)*	c	c	u	
Baird’s sandpiper *(Calidris bairdii)*	r	u		
Pectoral sandpiper *(Calidris melanotos)*		u		

Birds	Sp	S	F	W
Shorebirds				
Dunlin *(Calidris alpina)*	c	u		
Short-billed dowitcher *(Limnodromus griseus)*	r	r		
Long-billed dowitcher *(Limnodromus scolopaceus)*	c	c	c	
Common snipe * *(Gallinago gallinago)*	c	u	c	
Wilson's phalarope * *(Phalaropus tricolor)*	u	u	u	
Red-necked phalarope *(Phalaropus lobatus)*	u		u	
Gulls, Terns				
Bonaparte's gull *(Chroicocephalus philadelphia)*	c		u	
Franklin's gull (*Leucophaeus pipixcan*)	u		u	
Ring-billed gull *(Larus delawarensis)*	c	c	c	c
California gull *(Larus californicus)*	c	c	c	c
Herring gull *(Larus argentatus)*	u		u	u
Caspian tern *(Hydroprogne caspia)*	c	c	c	
Forster's tern * *(Sterna forsteri)*	c	c	c	
Black tern *(Chidonias niger)*	u	u	u	
Pigeons, Doves				
Eurasian collared dove (*Streptopelia decaocto*)	c	c	c	c
Rock pigeon* (I) *(Columba livia)*	c	c	c	c
Mourning dove *(Zenaida macroura)*	c	c	c	u
Owls				
Barn owl * *(Tyto alba)*	c	c	c	c
Great horned owl * *(Bubo virginianus)*	c	c	c	c
Long-eared owl *(Asio otus)*	r	r	r	
Short-eared owl *(Asio flammeus)*	r	r	r	r
Western screech owl *(Otus kennicottii)*	u	u	u	
Burrowing owl (*Athene cunicularia*) Historically common; No recent sighting				
Goatsuckers, Swifts, Hummingbirds				
Common nighthawk * *(Chordeiles minor)*		c		
Vaux's swift *(Chaetura vauxi)*	r			

Birds	Sp	S	F	W
Goatsuckers, Swifts, Hummingbirds				
Common poor-will *(Phalaenoptilus nuttallii)*		r		
Rufous hummingbird *(Selasphorus rufus)*	c	c	c	
Anna's Hummingbird *(Calypte anna)*		r	r	
Kingfisher				
Belted kingfisher *(Ceryle alcyon)*	u	u	u	u
Woodpeckers				
Lewis' woodpecker *(Melanerpes lewis)*			r	
Red-breasted sapsucker *(Sphyrapicus ruber)*			r	
Downy woodpecker *(Picoides pubescens)*			u	u
Hairy woodpecker *(Picoides villosus)*				r
Northern flicker * *(Colaptes auratus)*	c	c	c	c
Flycatchers				
Western wood-pewee *(Contopus sordidulus)*	u	u		
Willow flycatcher *(Empidonax traillii)*	u	u		
Hammond's flycatcher *(Empidonax hammondii)*	u			
Dusky flycatcher *(Empidonax oberholseri)*	u			
Gray flycatcher *(Empidonax wrightii)*	u			
Cordilleran flycatcher *(Empidonax occidentalis)*	r			
Black phoebe (*Sayornis nigricans*)	u			c
Say's phoebe *(Sayornis saya)*	c			
Western kingbird * *(Tyrannus verticalis)*	c	c		
Lark				
Horned lark * *(Eremophila alpestris)*	c	c	c	u
Swallows				
Purple martin *(Progne subis)*	r			
Tree swallow * *(Tachycineta bicolor)*	a	c		
Violet-green swallow *(Tachycineta thalassina)*	c			
Northern rough-winged swallow *(Stelgidopteryx serripennis)*	u	u		
Bank swallow *(Riparia riparia)*	u	u		
Cliff swallow * *(Petrochelidon pyrrhonota)*	a	c		

Birds	Sp	S	F	W
Swallows				
Barn swallow * *(Hirundo rustica)*	c	c		
Jays, Magpies, Crows				
Western Scrub jay *(Aphelocoma californica)*	u	u	u	u
Steller's jay *(Cyanocitta stelleri)*	r	r	r	r
Black-billed magpie* *(Pica hudsonia)*	c	c	cc	
Common raven *(Corvus corax)*	c		u	c
American crow *(Corvus brachyrhynchos)*				
Chickadees, Bushtits, Nuthatches, Creepers				
Mountain chickadee *(Poecile gambeli)*			u	u
Bushtit *(Psaltriparus minimus)*			u	
Red-breasted nuthatch *(Sitta canadensis)*			u	
White-breasted nuthatch (Sitta carolinensis)			u	u
Brown creeper *(Certhia americana)*			r	
Wrens				
Bewick's wren *(Thryomanes bewickii)*	u	u	u	u
House wren * *(Troglodytes aedon)*	u	u		
Marsh wren * *(Cistothorus palustris)*	c	c	c	u
Kinglets, Bluebirds, Thrushes				
Ruby-crowned kinglet *(Regulus calendula)*	c		c	
Mountain bluebird *(Sialia currucoides)*	u		u	u
Western bluebird *(Sialia mexicana)*	u		u	
Townsend's solitaire *(Myadestes townsendi)*	u	u	u	uo
Varied thrush *(Ixoreus naevius)*	u		u	
Hermit thrush *(Catharus guttatus)*			u	
American robin * *(Turdus migratorius)*	c	c	c	c
Pipits, Waxwings				
American pipit *(Anthus rubescens)*	c	c		
Bohemian waxwing *(Bombycilla garrulus)*			r	
Cedar waxwing *(Bombycilla cedrorum)*	u		u	u

Birds	Sp	S	F	W
Shrikes				
Northern shrike *(Lanius excubitor)*	r		u	u
Loggerhead shrike *(Lanius ludovicianus)*	r		r	
Starling				
European starling * (I) *(Sturnus vulgaris)*	a	a	a	c
Vireos, Warblers				
Solitary vireo *(Vireo solitarius)*	u		u	
Warbling vireo *(Vireo gilvus)*	u		u	
Orange-crowned warbler *(Vermivora celata)*	c		c	
Nashville warbler *(Vermivora ruficapilla)*	o		u	
Yellow warbler *(Dendroica petechia)*	c		c	
Yellow-rumped warbler *(Dendroica coronata)*	c		c	
MacGillivray's warbler *(Oporonis tolmiei)*	u		u	
Common yellowthroat *(Geothlypis trichas)*	u	u	u	
Black-throated gray warbler *(Dendroica nigrescens)*	r	r		
Wilson's warbler *(Wilsonia pusilla)*	u		u	
Townsend's warbler *(Dendroica townsendi)*	r			
Yellow breasted chat (*Icteria virens*)	r			
Tanagers, Grosbeaks, Towhees				
Western tanager *(Piranga ludoviciana)*	u		u	
Black-headed grosbeak *(Pheucticus melanocephalus)*	u		u	
Evening grosbeak *(Coccothraustes vespertinus)*	c		c	
Spotted towhee *(Pipilo maculatus)*	c		c	
Lazuli bunting *(Passerina amoena)*	u			
Sparrows				
American tree sparrow *(Spizella arborea)*			u	u
Chipping sparrow *(Spizella passerine)*	u	u		
Brewer's sparrow *(Spizella breweri)*		u	u	
Vesper sparrow * *(Pooecetes gramineus)*	u	u	u	
Lark sparrow *(Chondestes grammacus)*	r	r	r	

Birds	Sp	S	F	W
Sparrows				
House sparrow* (I) *(Passer domesticus)*	a	a	a	a
Fox sparrow * *(Passerella iliaca)*	u	u	u	u
Savannah sparrow * *(Passerculus sandwichensis)*	c	c	c	r
Song sparrow * *(Melospiza melodia)*	c	c	c	c
Lincoln's sparrow *(Melospiza lincolnii)*	u	u		
Golden-crowned sparrow *(Zonotrichia atricapilla)*	c		u	c
White-crowned sparrow *(Zonotrichia leucophrys)*	c		c	c
Harris' sparrow *(Zonotrichia querula)*				vr
Dark-eyed junco *(Junco hyemalis)*	c		u	c
Lapland longspur *(Calcarius lapponicus)*			r	r
Blackbirds				
Red-winged blackbird * *(Agelaius phoeniceus)*	c	c	c	c
Tricolored blackbird *(Agelaius tricolor)*	u	u	u	u
Western meadowlark * *(Sturnella neglecta)*	c	c	c	u
Yellow-headed blackbird * *(Xanthocephalus xanthocephalus)*	c	c	c	r
Brewer's blackbird * *(Euphagus cyanocephalus)*	c	c	c	c
Brown-headed cowbird * *(Molothrus ater)*	c	c	c	r
Bullocks oriole * *(Icterus bullockii)*	u	u		
Finches				
Purple finch *(Carpodacus purpureus)*			u	
Cassin's finch *(Carpodacus cassinii)*			u	
House finch * *(Carpodacus mexicanus)*	c	c	c	c
Pine siskin *(Carduelis pinus)*	u		u	
Lesser goldfinch *(Carduelis psaltria)*	c	c	c	
American goldfinch *(Carduelis tristis)*	c	c	c	

Appendix D. State and Federal Irrigation District water rights on KWA

State Certified Water Rights

HMU	Priority Date	Acres	Rate
Miller Island Unit; part of the Hooper and Dragon Pond HMUs	1919	190	2.38 cfs
Miller Island Unit; all or part of Hooper Lowlands, Hooper, Hamaker, HQ area, Dragon Pond, Miller Slough, and Rayson HMUs	1927	994.87	12.5 cfs
Miller Island Unit; all or parts of the Gregory, Miller Slough and HQ Area HMUs.	1951	85	2.13 cfs
	Total	**1,269.87**	**17.01 cfs**

Warren Act Irrigation District Water Rights (various priority dates)

HMU	Acres	Contract No.	Notes
Miller Island Unit; all or parts of Rayson, Miller Slough, Dragon Pond, Hooper, and Hamaker HMUs	420.5	I8R-1148	Approx 3.5 acre-feet/acre
Miller Island Unit; all or parts of Hamaker Lowland and Hooper Lowland HMUs	181.9	I8R-1314	Approx 3.5 acre-feet/acre
Miller Island Unit, all or parts of Hamaker, HQ Area, and Dragon Pond HMUs	123	I8R-963	Approx 3.5 acre-feet/acre
Miller Island Unit, all or parts of Delameter HMU	120	I8R-614	Approx 3.5 acre-feet/acre
Miller Island Unit, all or parts of Hamaker and Hamaker Lowland HMUs	33	I8R-1143	Approx 3.5 acre-feet/acre
Miller Island Unit, all or parts of Gregory and Miller Slough HMUs	62.9	I8R-1138	Approx 3.5 acre-feet/acre

Miller Island Unit, all or parts of Hamaker Lowlands and Delameter Lowlands HMUs	55	I8R-1195	Approx 3.5 acre-feet/acre
Miller Island Unit, all or parts of Hooper and Dragon Pond HMUs	94	I8R-857	Approx 3.5 acre-feet/acre
Total	**1,090.3**		**Total Duty 4010 acre-feet**

Klamath Adjudicated (Process is still under adjudication)

HMU	Priority Date	Acres	Rate
Klamath WA (Miller Island Unit)	January 1, 1900	700.1	3 acre-ft/acre

Klamath Irrigation District (Temporary Water Right)

HMU	Acres	Rate
Rayson	5.0	
Wilson Reservoir	1.15	

Appendix E. Easements and Access Agreements on KWA

See Deeds and Agreements file at the department's Realty Division for details.

Miller Island Unit

Easements

1. Power transmission line easements to Pacific Power and Light Company.

2. Telephone line easements to U.S. West.

3. A road easement to Klamath County that consists of one mile of graveled road starting at the end of the paved portion of Miller Island Road and ending where the gravel road turns into a dirt road.

4. A road easement to an access road and irrigation ditch on the Rayson Tract property.

5. A water canal easement to Lewis Furber, for the acquisition of Klamath River water located between the Hamaker and Delamater tracts.

6. An easement for the conveyance of water to the Massini property through the Hooper highline ditch.

7. A water canal easement to Lewis Furber, for the acquisition of Klamath River water located between the Hamaker and Delamater tracts.

Agreements

1. One grazing agreement that totals 350 acres on improved, irrigated pasture located in the Hooper HMU, Hamaker HMU, Delameter HMU, and Largent HMU's.

2. Forage removal agreement on 42 acres of irrigated alfalfa in the Largent HMU and 25 in the Delameter HMU.

3. Cooperative farming/Forage removal agreement on 104 acres of agricultural uplands in the Rayson and HQ HMU and approximately 296 acres on wetland restoration habitat in the Hamaker, DeLamter and S. Slough HMUs.

Appendix F. Legal Obligations Influencing Management of KWA

Federal Laws

Federal Aid in Wildlife Restoration Act (Pittman- Robertson Act of 1937)
The Endangered Species Act of 1973, as amended
National Historic Preservation Act
National Environmental Policy Act
Americans with Disabilities Act

Oregon Revised Statutes

ORS 496.012 Oregon's Wildlife Policy
ORS 496.138 General Duties and Powers; Rulemaking Authority
ORS 496.146 Additional Powers of the Commission
ORS 496.162 Establishing seasons, amounts and manner of taking wildlife; rules
ORS 496.992 Penalties

Oregon Administrative Rules

Division 008 - Department of Fish and Wildlife Lands
- 635-008-0015 Agreements to Restrict Motor-propelled Vehicles
- 635-008-0040 Forage Removal from State Lands
- 635-008-0050 Fish and Wildlife Commission to Post and Enforce Rules
- 635-008-0115 Klamath Wildlife Area

Division 011 - Statewide Angling Regulations
- 635-011-0050 Procedure of Promulgation of Angling Regulations
- 635-011-0100 General Rule

Division 051 - General Game Bird Regulations
- 635-051-0000 Purpose and General Information
- 635-051-0065 State Wildlife Area Regulations

Division 065 - Game Mammal General Seasons and Regulations
- 635-065-0001 Purpose and General Information
- 635-065-0625 Regulations on State Wildlife Areas, Refuges and Special Areas

Pacific Flyway and Species Plans

Appendix G. Description of Habitat Management Units on KWA

Introduction

This document describes physical features and management strategies for sixteen Habitat Management Units (HMUs) on Klamath Wildlife Area (KWA).These HMUs have been delineated based on historic uses, physical features or boundaries, vegetation types, current or past management activities and water sources. Wildlife and public use of these areas, as well as alternative management strategies will be described.

To understand how HMUs function toward meeting goals and objectives of the wildlife area it is important to have an appreciation of the inter-relationship between units, especially related to abundance, timing and distribution of water on KWA.

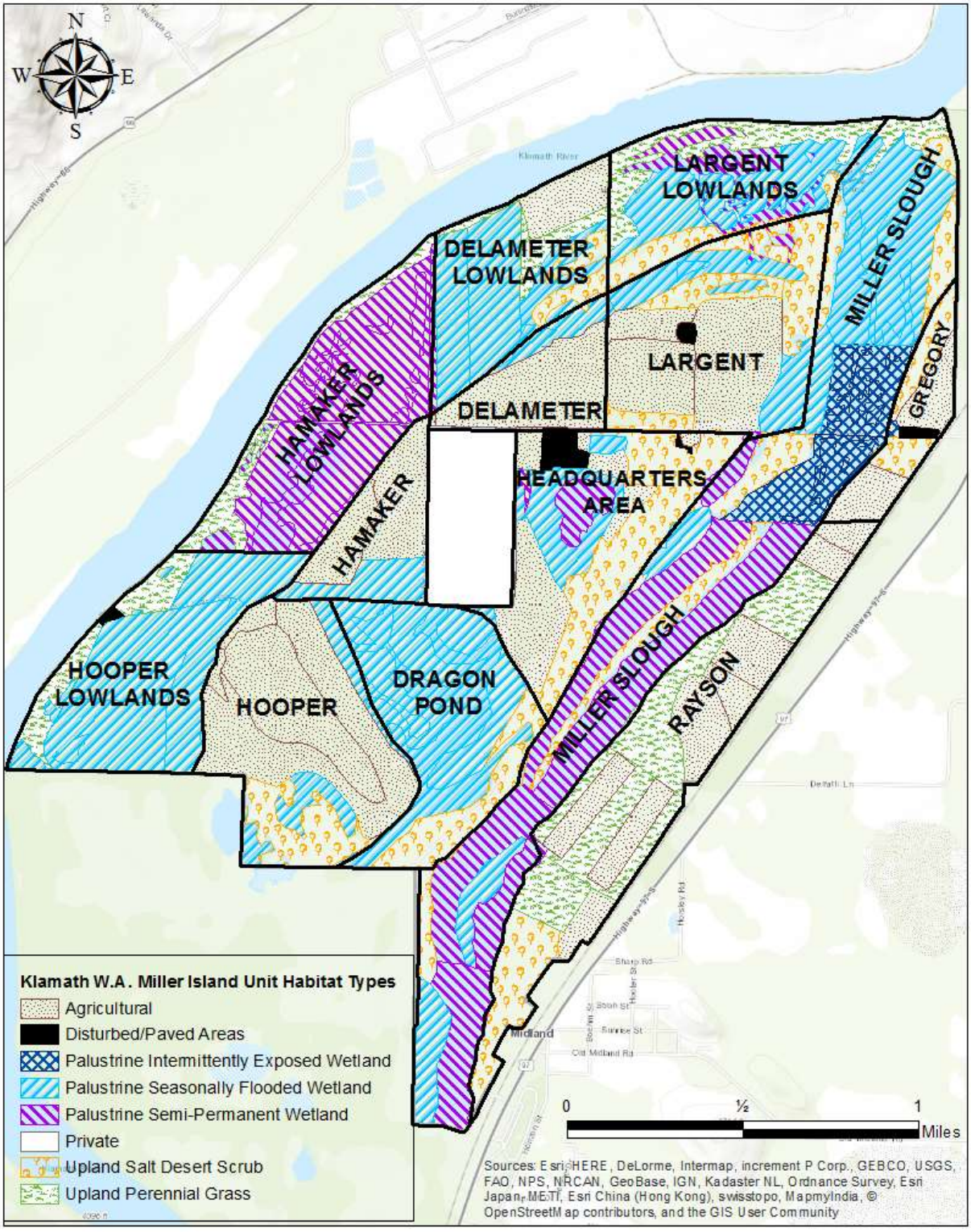
Three of the sixteen HMUs are directly associated with either Upper Klamath Lake or the Klamath River. Thirteen of the HMUs are located on the Miller Island Unit of the KWA and are diverse in nature (See **Figure 4**).

Three of the HMUs (Shoalwater Bay, Sesti Tgawaals Point, and Gorr Island) are dependent on water levels from Upper Klamath Lake or Klamath River. These wetlands function as a constant flow-through system, behaving in some ways similar to floodplain wetlands. Six of the HMUs on the Miller Island Unit are wetland units. Five of the six have potential of being managed as seasonal wetlands. Seven of the HMUs on Miller Island are mixed habitats with some upland and minor wetlands. In many cases habitat units are tied to one another in terms of water delivery. This affects habitat quality and quantity, as well as management capability. Actions in one unit can affect adjacent units.

Manipulation of Klamath River flows during irrigation season (May to September) for agricultural development in the basin has a significant effect on wetland management at KWA.

Precipitation in the Klamath Basin averages 13 inches annually, with open pan evaporation loss averaging 48 inches (USGS, 2006). Such weather extremes play an important role in water management at the KWA.

Figure 4 - Klamath W.A. Miller Island HMUs and Habitat Types



Shoalwater Bay

Background

Shoalwater Bay HMU is 605.8 acres in size and consists of predominantly lacustrine permanent and semi-permanent wetlands in good hemi-marsh (1:1 ratio of open water to emergent vegetation) condition. The southern portion of the unit has large pockets of hardstem bulrush. There are about 23 acres of mixed conifer and aspen uplands associated with this HMU.

In 1910, a Mr. Griffith, who then owned the marsh, employed J. Frank Adams to construct 1.25 miles of dike around the perimeter to permit drainage and prevent periodic flooding. In subsequent years the reclaimed farm land produced good stands of timothy and blue grass. Both the reclaimed land and the timber tracts were sold to a Mr. Gaddis about 1916.

As a need arose for additional power for the Klamath Basin, the California-Oregon Power Company (COPCO) dammed the outlet of Upper Klamath Lake to increase its storage capacity and power potential. The dam, completed in 1921, raised the lake six feet, to an elevation of 4,143 feet.

The dike associated with Shoalwater Bay, which had been made of peat soil, was too lightly constructed to withstand the pressure and wave action of the elevate lake level and eventually washed out. In order to settle damage claims and prevent future litigations COPCO acquired 1,240.8 acres of private holdings, including 648 acres of timberland on Eagle Ridge.

In the 1920s, a canal was dug along the length of the marsh to provide a water route through which logs could readily be floated from the surrounding forest to the open lake and local mills.

In 1951 COPCO offered to sell both the marsh and cut-over timberlands. These lands were purchased by the Oregon Game Commission (OGC), for $30,000, to prevent future drainage of the marsh. The timberlands were surplus to the Commission’s needs and were re-sold in 1964 to Klamath County for use as a public park for $10,000.

Eagle Ridge currently supports the highest concentration of nesting bald eagles in Oregon (5 nesting pairs). Two pairs are located on Klamath County property, two pair on JWTR, and one on the wildlife area at Sesti Tgawaals Point Unit (STPU).

Abundant populations of invertebrates provide food resources for early growth and development of goslings. Quality duck brood habitat is available. Abundant submerged aquatic vegetation and associated populations of invertebrates provide high protein food needed by broods and molting adults. High quality duck molting habitat is present due to its isolation (enhanced by vehicle travel restrictions), availability of invertebrates, good water depth and an abundance of tall emergent cover for escape and security.

Shorebirds make extensive use of the unit for breeding and foraging, especially in seasonally flooded wetlands along the western edge of the unit. During late summer when evapotranspiration rates are high and natural drawdown occurs, extensive mudflat and shallow water foraging areas are created to accommodate postbreeding and migrant shorebirds. Some annual food plants occur in these seasonal wetlands but are not extensive in abundance or distribution.

The entire unit is very popular and productive for waterfowl hunting. Hunting access is primarily by boat, although there are some shoreline blind hunting opportunities.

Aquatic habitat in this unit is also consistent with hiding and rearing requirements, as outlined by Buettner and Scoppettone (1990), for federally listed Lost River sucker (*Deltistes luxatus*) and short-nosed sucker (*Chasmistes brevirostris*) larvae and juveniles in Upper Klamath Lake.

Management Strategies

This unit will be maintained as permanent and semi-permanent wetland habitat. Because of its hydrologic connection to Upper Klamath Lake, management of water levels in this unit is dependent on lake level. Burning of decadent robust vegetation is essentially the only active management option for this unit. The management outcome will be to maintain the desired ratio of open water to robust tall emergent vegetation. This will provide habitat for over-water nesting, brood rearing, molting and migration needs.

Sesti Tgawaals Point

Background

In 1953, the OGC authorized the purchase of 143.5 acres of private inholdings within Sesti Tgawaals Point to prevent destruction of the marsh through proposed reclamation activities. The remaining inholdings (304 acres) belong to the State Land Board.

Shorebirds make extensive use of the Sesti Tgawaals Point Unit for breeding and foraging, especially in the seasonally flooded wetlands along the western edge of the unit. During late summer, when evapotranspiration rates are high and natural drawdown occurs, extensive mudflat and shallow water foraging areas are created to accommodate post breeding and migrant shorebirds. Some annual food plants occur in these seasonal wetlands but are not extensive in abundance or distribution.

The entire unit is a very popular and productive waterfowl hunting area. Hunting access is primarily by boat, although there is some shoreline blind hunting.

The aquatic habitat found in this unit also benefits Lost River sucker and short-nosed sucker larvae and juveniles.

In 1997, thirty-seven acres of upland ponderosa pine were donated to the department by Weyerhaeuser for inclusion into KWA, to protect a bald eagle nest site.

Management Strategies

This unit will be maintained as permanent and semi-permanent wetland habitat. This unit is also hydrologically connected to Upper Klamath Lake, so management of water levels is dependent on lake level. Again, burning of decadent robust vegetation is the only active management option available in this unit. The desired ratios of open water to robust tall emergent vegetation will be maintained to provide habitat for over-water nesting, brood rearing, molting and migration needs.

Cooperative monitoring of the existing bald eagle nest tree will be undertaken in partnership with the Oregon Eagle Foundation (OEF). Maintenance of other potentially suitable nest trees will also be a priority.

Gorr Island

Background

In 1953, the OGC acquired the Gorr Island Unit (161.5 acres) from private parties.The unit consisted of three separate parcels intermixed with land holdings of the Tulesmoke Gun Club. In 1977, land exchanges with the Tulesmoke Gun Club made possible the consolidation of public lands into one contiguous unit. This consolidation was part of the U.S. Bureau of Reclamation's Straits Drain improvement project.The original land exchange proposal called for the then new water intake canal (Ady Canal) to be split between the Tulesmoke Gun Club and public property.This proposal would have ensured public access to all parts of the Gorr Island Unit. However, the canal was eventually constructed solely on the Tulesmoke Gun Club's property which eliminated public hunter access along the north edge of the Gorr Island Unit.

Limited resting, loafing, and feeding areas are provided to the local and migratory waterfowl due to rank stands of vegetation. Some waterbird activities do occur along the western portion of Gorr Island where Pacific Power and Light constructed 20 potholes as mitigation measures when they dredged the Klamath River in 1969-71.

Management Strategies

This unit will be maintained as permanent and semi-permanent wetland habitat. Since this unit is hydrologically connected to Klamath River, the department is limited in its ability to manage water levels. Thus burning of decadent robust vegetation is the only active management option for this unit. The desired habitat outcome will be to maintain productive ratios of open water to robust tall emergent vegetation and to stimulate re-growth of green forage to benefit spring staging geese. This will provide also over water nesting features, brood rearing, and molting habitat.

Delameter

Background

The Delameter HMU is approximately 71 acres in size and is comprised almost entirely of improved pasture. The HMU was purchased from Homer A. Delameter in 1963. This HMU has been managed primarily as improved pasture, previously for cattle production, and more recently for spring green forage for staging geese. This unit has not been re-seeded in many years and efficient irrigation is difficult. Irrigation of the HMU is via a screened turbine pump with a discharge capacity of approximately 4cfs. This HMU is preconditioned for spring green forage by cattle grazing under permit from the department. This unit still provides beneficial spring green forage for geese, and due to its proximity to Miller Island Road, allows for public viewing of migrating geese.

Management Strategies

This unit will be maintained as a spring green forage unit. Evaluation of goose use will be conducted on an annual basis with the determination of when re-seeding will occur dependant on decreased use by spring migrating geese.

The primary purpose of grass/legume croplands is to provide highly nutritious forage for spring migrating geese. Studies have shown that the first 30 days of green-up provide twice as much nutritional value as do plants older than 30 days of age. This is due to the nutrient rush from the root wad to the apical meristem to promote plant growth. Geese keying in on these plants can purge their systems of toxicants accumulated during winter months in Central Valley of California, while increasing body condition, reducing susceptibility to disease and stress, and enabling them to migrate north in peak body condition. This in turn increases their chances of raising a successful brood.

Improvements to water delivery and irrigation efficiency at Delameter HMU will occur in the future when the pasture needs re-seeding. Fence rebuilding will also be undertaken at that time to protect the pasture from cattle during the re-seeding process.

Delameter Lowlands

Background

The Delameter Lowlands HMU was purchased from Homer A. Delameter in 1963. This 140 acre HMU has been managed primarily as agricultural land and a palustrine seasonally inundated wetland. The wetland portion of the HMU was historically divided into three sub units separated by low dikes.

This HMU as of recent had very little open water due to invasive and robust tall stature emergent vegetation. From 2015-16 the HMU was cooperatively farmed resulting in the set back of the tall emergent vegetation.Submerged aquatic plants are abundant and contain immense invertebrate populations. Tui chub and fathead minnow are numerous in the ponds. The west portion of the unit is comprised of a very heterogeneous mix of

upland knolls, points and peninsulas consisting of high quality dense nesting cover. Willow (*Salix* spp) stands are developing on the north portion of the HMU as well.

The majority of the upland area is a result of placement of spoil from the dredging of the Klamath River in 1970 – 1971. Approximately 33 acres of marshland were filled by Klamath River dredging activities. This acreage was planted to alfalfa in 1973 followed by another planting of ranger alfalfa in 1975. The agricultural uplands (approximately 22 acres) were seeded in the spring with Baroness barley as part of invasive broadleaf vegetation control prior to re-seeding back into alfalfa. In 2016 the field was replanted into alfalfa. The other 11 acres are managed as an upland perennial grass stand for nesting and cover.

Eight acres of the HMU are a palustrine seasonally inundated wetland that manifests as a short alkali grass habitat. This area is utilized by shorebirds for nesting.

Agricultural land in the HMU is irrigated by wheel-line irrigation from a screened pressure pump. The wetland habitat is filled by overflow from the Delameter HMU irrigation system.

Management Strategies

Delameter Lowlands Unit will be managed as a seasonal wetland to obtain associated wildlife benefits. On an 8-10 year cycle the unit will be drawn down to the greatest extent possible for most of the growing season to control robust tall stature emergent vegetation managed through controlled burning and cooperative farming to maintain important open water and early successional wetland features.

Waterbird use will be improved when drawdowns occur due to increased availability of foraging sites previously under water. Depending on the timing of fall flooding and weather conditions, invertebrate and vegetation re-growth could result in increased waterfowl use and improved hunting success. Viewing use will be enhanced when drawdowns and flooding occurs in spring and fall, respectively.

The upland agricultural portion of the HMU will be managed for green forage (alfalfa) for spring migrating geese. In order to encourage the share-cropping of this field, invasive broadleaf vegetation will be chemically controlled to reduce competition with the desired plants and increase alfalfa yield for cropping and forage.

Dragon Pond

Background

The Dragon Pond HMU was purchased from B. B. Hooper in 1957. This 191 acre HMU is a complex mixed habitat HMU with 79 acres of palustrine seasonally inundated alkali flat, 78 acres of palustrine seasonally inundated wetland, and approximately 30 acres upland shrub steppe. This HMU has been managed primarily as a seasonally flooded wetland with uplands being utilized for nesting by black-necked stilt and American

avocet. Open water ponds are well vegetated with submerged aquatic plants and have stands of tall stature emergent situated along their margins. Tall stature emergents have recently invaded into the southern portion and fringe areas of the wetland habitat.

Wetlands in this unit obtain water from overflow from the irrigation or the Hooper HMU to the west, and from a canal on the southern end of the HMU.

Management Strategies

Management direction is to maintain and manage the unit as seasonal wetland to obtain the associated wildlife benefits. On an 8-10 year cycle the unit will be drawn down to the greatest extent possible and held at low levels most of the growing season to enhance wetland productivity and to control robust tall statured emergent vegetation through controlled burning, herbicide treatments or by mechanical means to maintain important open water features. Upland shrub-steppe will be maintained to provide habitat and nesting for upland and waterfowl species. The alkali flat habitat will also be maintained for shorebird nesting. Occasional burning may be required on the upland and alkali flat habitats to maintain the habitat in desired condition.

Gregory

Background

The Gregory HMU was purchased from Almond Gregory in 1954. This 73 acre HMU has been managed primarily as an upland nesting area and for annual cereal grain production for wintering and migrating waterfowl. Approximately 35 acres is an upland salt desert scrub habitat, 18 acres agricultural cereal grain and 20 acres improved pasture. Irrigation on 20 acres of agricultural land is provided by a turbine pump with a discharge capacity of approximately 3cfs. The pump draws water out of a canal associated with the Miller Slough HMU. This portion of the Gregory HMU is presently improved pasture, and being in proximity to Miller Island Road, allows for public viewing of foraging geese. The remainder of the agricultural land in this HMU is planted to winter wheat and triticale to provide spring green forage for staging geese. This winter wheat portion of the unit does not presently have irrigation infrastructure in place, however, historic irrigation was by a turbine pump and flood irrigation.

Management Strategies

The grassy shrub steppe habitat will continue to be managed as nesting and escape cover for wildfowl. Flood irrigation allows the department to flood irrigate 20 acres of improved pasture. To maintain a remnant of winter/spring cereal grain, the 18 acres will continue to be managed as a spring seeded crop.

Hamaker

Background

The Hamaker HMU was purchased from H. E. Hamaker in 1968. This 77 acre HMU has been managed primarily as improved pasture, previously for cattle production, and more recently as spring green forage for staging geese. Irrigation of the HMU is by a screened mixed-flow turbine pump with a discharge capacity of approximately 4 cfs. This unit is preconditioned for spring green forage by cattle under a department grazing permit. This unit still provides beneficial spring green forage for geese, and being in proximity to Miller Island Road, allows for public viewing of migrating geese.

Management Strategies

This unit will be maintained as a spring green forage unit. Evaluation of goose use will be conducted on an annual basis. Determination of when re-seeding is to occur will be dependant on the decreased use by spring migrating geese. When re-seeding is necessary, this will provide the opportunity to improve irrigation efficiency on the pasture by leveling and interior water-spreading infrastructure. Fence rebuilding will also be undertaken, as the unit will not be pastured during the re-seeding process.

Hamaker Lowlands

Background

The Hamaker Lowlands HMU was purchased from H. E. Hamaker in 1968. This 215 acre HMU was historically utilized as lowland grazing and haying by earlier settlers. In later years it was leveled by Earl Hamaker and leveled for subsequent planting to an annual barley crop. The majority of this HMU is now managed as a palustrine semi-permanent wetland. Inundation of this HMU is via two culverts which extend through the COPCO dike into the HMU. This HMU had become dominated by tall stature emergent vegetation. Open water in many of the ponds and potholes was diminished due to invasive and robust tall stature emergent vegetation. Where open water existed submerged aquatic plants were abundant and contained immense invertebrate populations. Tui chub and fathead minnow were abundant in ponds. The west portion of the unit contains a very heterogeneous mix of upland knolls, points and peninsulas consisting of high quality dense nesting cover. Starting in 2016 the unit has been dried, burned and disked to try and set back succession in this HMU. This HMU is divided into two floodable sub units divided by an east-west dike extending across the HMU.

Management Strategies

Management direction is to maintain and manage the unit as a semi-permanent wetland to obtain associated wildlife benefits. On an 8-10 year cycle the unit will be drawn down to the greatest extent possible and held at low levels most of the growing season to enhance wetland productivity. Robust tall stature emergent vegetation will be managed through controlled burning, herbicide treatments or mechanical means to maintain important open water features.

Waterbird use will be improved when drawdowns occur due to increased availability of foraging sites previously under water. Plant production and subsequent waterbird use is expected to decline in the short term. Depending on weather conditions and timing of fall flooding invertebrate and vegetation regrowth could result in increased waterfowl use and improved hunting success. Viewing use will be enhanced when drawdowns and flooding occurs in spring and fall, respectively.

Hooper

Background

The Hooper HMU was purchased from J. C. Hooper in 1954 and 1966. This 202 acre HMU has been managed primarily as an improved pasture previously for cattle production, and more recently for spring green forage for staging geese. This unit has not been re-seeded for many years, and efficient irrigation is difficult. Irrigation is provided via a screened turbine pump with a discharge capacity of approximately 5.5 CFS. This unit is preconditioned for spring green forage by cattle grazing under a department permit. This unit still provides beneficial spring green forage for geese, and being in close proximity to Boat Ramp Road, allows for public viewing of migrating geese.

The 32 acre upland shrub-steppe portion of the HMU is dominated by rabbitbrush and big sage, and has historically had a small population of state and federally listed Applegate's milk-vetch located in the north east portion of the habitat.

Management Strategies

This unit will be maintained for spring green forage. Evaluation of goose use will be done on an annual basis. Determination of when re-seeding is to occur will be dependant on decreased use by spring migrating geese. When re-seeding is necessary, this will provide the opportunity to improve irrigation efficiency on pastures by leveling and interior water spreading infrastructure. Fence rebuilding will also be undertaken, as the unit will not be pastured during the re-seeding process.

Habitat protection for the Applegate's milk-vetch will continue with invasive plant reduction by mechanical or chemical means.

Hooper Lowlands

Background

The Hooper Lowlands HMU is a 179 acre HMU which was purchased in 1957 from B. B. Hooper. Historically, the 117 acre palustrine seasonally inundated wetland was utilized as lowland agricultural area, being utilized as a grazing and haying area, then later, after the COPCO dike installation, planted to annual cereal grains. Presently this portion of the HMU is managed as a seasonal wetland.

There is a twenty acre dog training area located in the upland perennial grass habitat.

Management Strategies

Management direction is to maintain and manage wetland portions of the HMU as a seasonal wetland to obtain associated wildlife benefits. On an 8-10 year cycle the wetlands will be drawn down to the greatest extent possible and held dry most of the growing season to enhance wetland productivity and manage robust tall stature emergent vegetation through controlled burning, herbicide treatments or mechanical means to maintain important open water features. Annual cereal grain planting could also be utilized as a rotational habitat manipulation in the historic agricultural areas.

Waterbird use will be improved when drawdowns occur due to increased availability of foraging sites previously under water. Plant production and subsequent waterbird use is expected to decline in the short term. Depending on weather conditions and timing of fall flooding, invertebrate and vegetation re-growth could result in increased waterfowl use and improved hunting success. Viewing use will be enhanced when drawdowns and flooding occurs in spring and fall, respectively.

Headquarters Area

Background

This HMU was purchased primarily from A. L. Boehm and O. C. George in 1954. Historically, the uplands were cultivated for annual cereal grains and marginal cattle grazing. The wetland units were a result of run-off from irrigation from adjacent private land and from flood irrigation from Delameter HMU. Currently, the Headquarters Area HMU is a 194 acre mixed HMU with salt desert scrub and sagebrush steppe making up the bulk of the habitat with 82 acres of greasewood and big sage. This habitat is a remnant of the type of upland habitat that existed on the island prior to settlement. Approximately 16 acres are planted to fall seeded cereal grains for green forage, and 30 acres are in spring seeded barley to provide a cereal grain resource for late winter and early spring utilization by migrating geese.

The wetlands primarily take form as a large seasonal pond south of the headquarters complex about 32 acres in size.

The headquarters complex has a footprint of approximately nine acres.

Management Strategies

The upland shrub-steppe will be maintained as an example of the historic insular habitat, and for upland waterfowl nesting.

Wetland portions of this unit have seen an abundance of robust tall stature emergent vegetation proliferate along the shallower perimeter of the pond. This vegetation will be

managed through controlled burning, herbicide treatments or mechanical means to maintain important open water features.

Agricultural sites will be rotated into fall-seeded annual cereal grain, either winter wheat or triticale, to provide green forage resources for spring migrating geese. Since these areas are not irrigable, fall-seeded crops should be well suited for this use since marketability of the seed is not a high priority.

Once the capacity of the upland agricultural sites is determined, these parcels may be rotated from green forage to late-winter and early spring grain resource.

Largent

Background

The Largent HMU consists of 202 acres of agricultural, wetland, and upland habitats. The agricultural area is a combination of 42 acres of alfalfa and about 80 acres of improved pasture. Approximately 15 acres of wetlands are primarily palustrine seasonally inundated wetlands and were developed in the 1970s to increase habitat complexity in the unit. The remaining upland habitat is a salt desert scrub with perennial grass to provide upland nesting for wildfowl.

This HMU has historically been in agriculture, either as improved pasture or cereal grain production, and has changed little since the department purchased it in 1967 from H. B. Largent. The 27 acre alfalfa field was rotated from pasture in 1979 and has been subsequently re-planted once, approximately ten years ago.

The improved pasture is grazed annually by permit to precondition grass and forbs for early green-up in spring months to provide green forage resource for migrating geese.

Irrigation of alfalfa is provided via a screened pressure pump and associated sprinkler wheel-line. The improved pasture is flood irrigated by a screened turbine lift pump.

Management Strategies

This unit will be maintained as a spring green forage unit. Evaluation of goose use will be conducted on an annual basis. Determination of when re-seeding will occur is dependant on decreased use by spring migrating geese. When re-seeding is necessary the department will improve irrigation efficiency on the improved pasture by leveling and constructing interior water spreading infrastructure. Fence rebuilding will also be undertaken, as the unit will not be pastured during the re-seeding process.

Part of the wetland component of this unit is in the form of a three acre artificially developed deep-water pond, which has been managed as a seasonal wetland.

Largent Lowlands

Background

The Largent Lowlands HMU is a 145 acre mix of wetlands and upland habitats. Wetlands are comprised of palustrine seasonally inundated and semi-permanent wetlands. Uplands are salt desert scrub with rabbitbrush dominating the habitat with a mix of native and introduced perennial grass as an understory. This HMU was purchased from H. B. Largent in 1958 and 1963. During Largent family ownership the HMU was primarily used as agricultural land, foremost in grazing, haying and cereal grain production.

By 1982 the department discontinued cattle grazing in Largent Lowlands HMU to encourage rank vegetation growth for waterfowl nesting. Since that time, most of the lowlands have been managed as a seasonal wetland.

Water management is challenging since the water supplying the HMU comes primarily from two culverts through the COPCO dike along the perimeter of the wildlife area, and drawdown of the Klamath River in this reach are infrequent, limiting the rotation intervals for seasonal wetland management. This encourages growth of tall emergent vegetation which has begun to slow water transport throughout the HMU and reduces attractiveness to waterfowl, shorebirds, and other species.

Management Strategies

Management direction is to maintain and manage wetland portions of the HMU as a seasonal and semi-permanent marsh to obtain associated wildlife benefits. On an 8-10 year cycle the wetlands will be drawn down to the greatest extent possible and held at low levels most of the growing season to enhance wetland productivity. Robust tall stature emergent vegetation will be managed through controlled burning, grazing, herbicide treatments or mechanical means to maintain important open water features. Annual cereal grain planting could also be utilized as a rotational habitat manipulation in the historic agricultural areas.

Waterbird use will be improved when drawdowns occur due to increased availability of foraging sites previously under water. Plant production and subsequent waterbird use is expected to decline in the short term. Depending on the timing of fall flooding and weather conditions invertebrate and vegetation re-growth could result in increased waterfowl use and improved hunting success. Viewing use will be enhanced when drawdowns and flooding occurs in spring and fall, respectively.

Miller Slough

Background

The Miller Slough HMU is one of the largest HMUs on Miller Island, comprising a mix of almost 515 acres of palustrine seasonally inundated wetlands, intermittently exposed wetlands, semi-permanent wetands and salt desert scrub habitats. This HMU was purchased from a number of private landowners; A. L. Boehm in 1954, A. E. Gregory in

1954 and 1955, B. B. Hooper in 1957, and H. B. Largent in 1958. This HMU, prior to the installation of the COPCO dike, isolated Miller Island from the rest of the county. Subsequent to the development of the dike, cereal grain crops and pasture were grown on wetland units. Following acquisition by the department, there have been significant changes to this HMU to improve wetland management opportunities. Ducks Unlimited completed a habitat project in this HMU in 1989, splitting the generally contiguous unit into nine floodable units with over fifty nesting islands. Ponds are well vegetated with stands of tall stature emergents situated throughout the unit.

Management since that time has been as a seasonally inundated wetland, rotating units on a three – four year basis, being dry for one year and inundated the remainder of time.

The uplands are managed as waterfowl nesting habitat, with rabbitbrush and big sage complemented by perennial grass.

Management Strategies

Management direction is to maintain and manage wetland portions of the HMU as intermittently exposed, semi-permanent and seasonal marsh to obtain associated wildlife benefits. The northern most portions of the HMU will be managed as seasonal wetlands. On a four to five year cycle wetlands will be drawn down to the extent possible and held at low levels or completely dried for most of the growing season to enhance wetland productivity. Robust tall stature emergent vegetation will be managed through controlled burning, herbicide treatments or mechanical means to maintain important open water features. Annual cereal grain planting could also be utilized as a rotational habitat manipulation in the historic agricultural areas. The rest of the wetland HMU will be managed as intermittently exposed and semi-permanent wetlands. Wetlands will be dried every 8-10 years or as needed mimicking drought conditions. Robust tall stature emergent vegetation will be managed through controlled burning, herbicide treatments or mechanical means to maintain important open water features. Annual cereal grain planting could also be utilized as a rotational habitat manipulation in the historic agricultural areas.

Rayson

Background

The Rayson HMU is 250 acres in size comprised of a mix of upland habitats. Salt desert scub and perennial grasses make up the bulk of the unit comprising about 150 acres, with 100 acres of agricultural ground. This HMU was purchased from S. C. Rayson in 1954 and B. B. Hooper in 1957.

The perennial grass habitat was developed in the 1970s and 1980s to enhance upland nesting for waterfowl. Primarily planted to tall and intermediate wheatgrass, sweet clover, and Great Basin wild rye, it also provides an opportunity for upland game bird nesting and hunting.

The agricultural ground was historically planted to spring barley for late winter/early spring utilization by migrating geese. Irrigation is primarily by state certified water rights, but recently, due to insufficient irrigation infrastructure, fall seeded crops have been planted. Recently some irrigation infrastructure has been improved through the purchase of a wheel-line, traveling water reel and mobile diesel irrigation pump.

On average approximately fifty acres of the agricultural area is planted each year to spring green forage.

The upland salt desert scrub habitat is dominated by rabbitbrush, big sage, and greasewood. This is also contains one of the sites where federal and state listed Applegate's milk-vetch occurs.

Management Strategies

General management direction for this HMU will be to increase fall seeded crop acreage to provide a greater spring green forage base. Spring seeded cereal grain production will be reduced to accommodate this change. Spring goose utilization will be monitored to determine if there is a preference for winter wheat or triticale.

A portion of the perennial grass habitat will also be managed to provide more spring green forage resources by fall burning, preferably after the majority of the upland game bird hunting is over.

Habitat protection for the Applegate's milk-vetch will continue with reduction of invasive plants by mechanical or chemical means.