Conservation Planning for Wildlife at Newton Creek Wetlands, Benton County, Oregon

Prepared for the Marys River Watershed Council, Marys Peak Natural Resources Interpretive Center & Philomath Scout Lodge

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I. Introduction

Newton Creek Wetlands is 214 ac semi-natural area located on the site previously occupied by the Clemens sawmill in Philomath, Oregon (Figure 1). The area includes several tax lots owned by two different owners. The Philomath Scout Lodge owns 58 acres on the east side of Newton Creek Wetlands; the Mary's Peak Natural Resources Interpretive Center (MPNRIC) currently holds an option to purchase 124 acres on the western portion of the property from Lakeside Industrial Park. MPNRIC has plans to develop an educational facility at the site. The Marys River Watershed Council has assembled a team of natural resource specialists to conduct a biological assessment, identify conservation opportunities, and prepare management recommendations. As part of the planning team, The Oregon Wildlife Institute (OWI) has conducted wildlife surveys and habitat evaluations during 2007-2008 that will be integrated into conservation planning for Newton Creek Wetlands. This report describes the methods and results of our wildlife assessment for the area.

II. Wildlife Surveys

OWI began conducting informal observations of wildlife at Newton Creek Wetlands during May 2007 At that time, OWI began a pilot study of Northwestern pond turtle demography and movement at the site. A description of that study can be found on Appendix I. During fieldwork for the pond turtle study, OWI wildlife biologists began recording observations of other vertebrates present at Newton Creek Wetlands. Reconnaissance surveys for amphibians, reptiles, and birds began in Fall 2007 and continued through June 2008. Results of these wildlife surveys are described below.

A list of threatened, endangered, and rare plant and animal locations known to be within a two-mile radius of the approximate center of the survey area was acquired from the Oregon Natural Heritage Information Center (ORNHIC). Sightings of wildlife species that were recorded in the ORNHIC database have been included in the tables of amphibians, reptiles, birds, and mammals observed at Newton Creek Wetlands.

Amphibian and Reptiles

Methods

Visual encounter surveys for reptiles and amphibians were conducted on September 27 and October 23, 2008 for a total sampling effort of 6.5 hours. The surveyor (D. Vesely) performed searches in locations that were representative of major plant communities in Newton Creek wetlands (e.g., prairies, oak woodlands, flooded channels for Northwestern pond turtles). Search methods included stalking likely basking areas (e.g., dirt roads for snakes, emergent logs in flooded channels for turtles), overturning natural cover objects such as logs and rocks, and listening for calling frogs. Cover boards placed for reptiles in the vicinity of Berm Pond by Philomath High School ecology students (PHS) were examined during surveys. Results of previous amphibian and reptile searches by PHS students are also reported. Locations of rare or threatened species detected during surveys were recorded with a GPS and mapped.

The survey area was visited 3 times (Feb 22, Mar 6, Mar 7, 2008) to search for egg masses of northern red-legged frogs (*Rana aurora aurora*). These visits coincided with the peak of oviposition for the species in the Willamette Valley. The surveyor (D. Vesely) wandered throughout the survey area and carefully examined pond shorelines, ephemeral pools, ditches, and seasonal wetlands for egg masses, tadpoles, and adult frogs. Geographic coordinates for all locations where the species was detected were recorded with a GPS and mapped.

OWI conducted a study on the movements, nesting, and population demography of the Northwest pond turtle at Newton Creek Wetlands during spring-summer 2007. The OWI report for this study is included in its entirety (Attachment I) and its findings summarized in Section III.

Results and Discussion

Five species of amphibians and seven species of reptiles were detected at Newton Creek wetlands during 2007 surveys or earlier searches (Table 1). Searches for red-legged frog oviposition sites during winter 2008 failed to detect any egg masses. However, one adult frog was observed and its position recorded during plant surveys conducted in the summer 2007.

Three of the species (i.e., clouded salamander, northern red-legged frog, and Northwestern pond turtle) have special conservation status designated by federal or state agencies, but their status does not give their populations or habitats any protection beyond what is afforded under state law to all native wildlife. These three species are discussed further in Section III of this report.

Table 1. Amphibians and reptile species known to occur at Newton Creek wetlands, Benton County, Oregon.

Common Name	**Scientific Name**	**Conservation Status** [1]
Long-toed salamander	*Ambystoma macrodactylum*	
Clouded salamander	*Aneides ferreus*	OCS
Rough-skinned newt	*Taricha granulosa*	
Pacific treefrog	*Hyla regilla*	
Northern red-legged frog	*Rana aurora aurora*	OCS
Bullfrog[2]	*Rana catesbiana*	
Northwestern pond turtle	*Emys marmorata marmorata*	OCS
Northern alligator lizard	*Elgaria coerulea*	
Rubber boa	*Charina bottae*	
Racer	*Coluber constrictor*	
Ringneck snake	*Diadophis punctatus*	
Gopher snake	*Pituophis catenifer*	
Common garter snake	*Thamnophis sirtalis*	

[1] Oregon Conservation Strategy Species (ODFW 2006)
[2] Non-native, invasive species

Every plant community and aquatic feature represented in Newton Creek wetlands likely is used by amphibians and reptiles. The composition of the herpetofauna community shifts according to the habitat structure of the plant community and the particular life requisites of each herpetofauna species. The northern alligator lizard, rubber boa, and ringneck snake are usually associated with woodlands or forest edges. Downed logs, rock outcrops, and mammal burrows are important habitat elements for these species. It appears that some individuals of these woodland species are able to extend their home ranges into grassland and shrubby habitats because of the large number of cover boards deliberately placed for ongoing reptile surveys at Newton Creek wetlands. Species that we did not detect in the survey area, but nevertheless could be expected to occur in Newton Creek woodlands are the western skink (*Eumeces skiltonianus*), western fence lizard (*Sceloporus occidentalis*), and sharp-tailed snake (*Contia tenuis*).

At least 16 species of amphibians and reptiles are associated with wet prairies, upland prairies, meadows or other grassland communities in the Willamette Valley (though one species may have been extirpated). The racer, gopher snake, and common garter snake are three species closely associated with these habitat types. Another common grassland species, that has not been detected, but could be expected to occur in the area is the Northwestern garter snake (*Thamnophis ordinoides*). Two species that were once common in the Willamette Valley, the spotted frog (*Rana pretiosa*) and northern Pacific rattlesnake (*Crotalus viridis oreganus*) have been extirpated from most of their original geographic ranges west of the Cascades.

Six of the native herpetofauna species known to occur at Newton Creek wetlands require both aquatic and terrestrial habitats at different life stages. The long-toed salamander, rough-skinned newt, and the three frog species lay their eggs in ponds, slow-moving streams, or ephemeral aquatic habitats. Larval life forms of these species remain in water until metamorphosis, at which time they will spend much of their life on land or at the margins of waterbodies. Adult Northwestern pond turtles are highly aquatic, but nest on land.

Birds

Methods

The three major ponds at Newton Creek Wetlands were visited on multiple occasions from mid-December 2007 through late-March to observe wintering waterfowl and shorebirds. The species detected during winter visits are included on the comprehensive list of all avian species observed at Newton Creek Wetlands (Table 2).

Methods of breeding bird observation and data recording generally followed that of the Breeding Bird Atlas (BBA) program (http://www.bsc-eoc.org/norac/atlascont.htm. This survey approach was selected because it does not restrict surveyors to fixed points or transects, rather it allows them to closely investigate bird activity they observe as they visit different habitats in the survey area. The approach does not permit estimates of bird

abundance, but does result in a comprehensive list of species using the study area and observations of bird behavior that may confirm breeding or rearing for each species. Breeding status determinations are based on territorial displays and reproductive behaviors observed. To make the observations spatially-explicit, we used a GIS to superimpose a 6X6 grid (cell size 740-ft X 540-ft) over an aerial photo of the survey area and recorded all bird species observed in each cell. Bird lists for individual cells have been compiled for future conservation planning at Newton Creek wetlands, but are not reported in this document. For each bird observation, the wildlife habitat type in which the bird was detected was recorded. Description of wildlife habitat types are provided in Section III of this report.

Bird observations were performed by David Vesely during three visits to the survey area on June 3, June 9, and July 4. Observations were conducted between sunrise and 9:00 am to coincide with the peak of bird activity. During each visit, the surveyor walked throughout Newton Creek Wetlands in a manner most likely to maximize the probability of detecting diurnal bird species in the unit aurally or visually. For each bird observed, we categorized the likely breeding status based on behavior according to a protocol developed by the Breeding Bird Atlas Program. Three levels of breeding probability are defined: Possible (PO), Probable (PR), and Confirmed (CO). Locations of species having special status (i.e., federal or state listed T&E, USFWS Species of Concern, ODFW Sensitive Species) were recorded with a Garmin GPS 60 with a reported positional accuracy of 2-3 meters.

Results

Seventy-six native bird species were detected during bird surveys and and incidental sightings in 2007 and 2008 (Table 2). Three introduced species, the rock dove, European starling, and house sparrow were also observed in the area. Five species that were detected are included on the ODFW list of Oregon Conservation Strategy Species (Table 2). These species have been determined to have low or declining populations and are need of conservation actions to aid their recovery. However, Strategy Species are not afforded special protection beyond that of other most other native wildlife species.

Table 2. Breeding status and primary wildlife habitat types used by bird species detected during 2007-2008 at Newton Creek Wetlands, Benton County, Oregon. Breeding status definitions follow that of the Breeding Bird Atlas Program. Primary wildlife habitat type(s) were determined by identifying the first and second most frequently used habitat types in which the species was detected during spring-summer surveys.

Common Name	Scientific Name	Breeding Status[1]	Primary Habitat Type(s)[2]	Oregon Strategy Species
Green heron	*Butorides virescen*	OB	OW	
Great blue heron	*Ardea herodias*	OB	OW, Gr	
Great egret	*Ardea alba*	OB	OW, Gr	
Canada goose	*Branta canadensis*	PR	OW, Ds	
Wood duck	*Aix sponsa*	OB	OW, Wm	
Mallard	*Anas platyrhynchos*	PR	OW	
Green-winged teal	*Anas crecca*	OB	OW	
American wigeon	*Anas americana*	OB	OW	
Northern shoveler	*Anas clypeata*	OB	OW	
Blue-winged teal	*Anas discors*	PR	OW	
Cinnamon teal	*Anas cyanoptera*	PR	OW	
Ring-necked duck	*Aythya collaris*	OB	OW	
Lesser scaup	*Aythya affinis*	OB	OW	
Common merganser	*Mergus merganser*	OB	OW	
Turkey vulture	*Cathartes aura*	OB	Wm, Ds	
Osprey	*Pandion haliaetus*	OB	OW	
Red-tailed hawk	*Buteo jamaicensis*	PR	Wm, Ds	
American kestrel	*Falco sparverius*	OB	Sa, Wo	
California quail	*Callipepla californica*	PR	Ds, Gr	
American coot	*Fulica americana*	OB	OW	
Killdeer	*Charadrius vociferus*	OB	Ds, Gr	
American coot	*Fulica americana*	OB	OW	
Spotted sandpiper	*Actitis macularia*	OB	OW	
Wilson's snipe	*Gallinago delicata*	OB	Gr, Wo	
Rock dove[3]	*Columba livia*	OB	Ds, Wo	
Mourning dove	*Zenaida macroura*	PR	Wm, Ds	
Great-horned owl	*Bubo virginianus*	OB	Wo	
Common nighthawk	*Chordeiles minor*	OB	Ds, Gr	X
Vaux's swift	*Chaetura vauxi*	OB	Ds, Sh	
Rufous hummingbird	*Selasphorus rufus*	PR	Sh, Ds	
Belted kingfisher	*Ceryle alcyon*	OB	OW	
Acorn woodpecker	*Melanerpes formicivorus*	CO	Wo	X
Downy woodpecker	*Picoides pubescens*	PR	Sh, Wm	
Northern flicker	*Colaptes auratus*	PR	Wo, Ds	
Western wood-pewee	*Contopus sordidulus*	PR	Sh, Wm	
Black phoebe	*Sayornis nigricans*	OB	Wm, Wo	
Little willow flycatcher	*Empidonax traillii brewsteri*	OB	Sh	X
Black phoebe	*Sayornis nigricans*	OB	Ds	
Warbling vireo	*Vireo gilvus*	OB	Sh	
Hutton’s vireo	*Vireo huttoni*	PR	Wo, Wm	

Table 2 (continued)

Western scrub-jay	*Aphelocoma californica*	PR	Ds, Sh	
American crow	*Corvus brachyrhynchos*	PR	Ds, Sh	
Violet-green swallow	*Tachycineta thalassina*	CO	Ds, Sh	
Tree swallow	*Tachycineta bicolor*	CO	Ds, Sh	
Barn swallow	*Hirundo rustica*	OB	Ds, Sh	
Black-capped chickadee	*Poecile atricapillus*	PR	Sh, Wo	
Chestnut-backed chickadee	*Poecile rufescens*	CO	Wm	
Bushtit	*Psaltiparus minimus*	OB	Sh	
Slender-billed nuthatch	*Sitta carolinensis*	PR	Wo	X
Brown creeper	*Certhia americana*	OB	Wm, Wo	
House wren	*Troglodytes aedon*	OB	Sh	
Bewick's wren	*Thryomanes bewickii*	PR	Sh	
Marsh wren	*Cistothorus palustris*	PR	Sh	
Wrentit	*Chamaea fasciata*	PR	Sh	
Western bluebird	*Sialia mexicana*	OB	Wo, Wm	X
American robin	*Turdus migratorius*	PR	Gr, Ds	
Swainson's thrush	*Catharus ustulatus*	OB	Sh	
European starling[3]	*Sturnus vulgaris*	CO	Ds	
Cedar waxwing	*Bombycilla cedrorum*	OB	Sh, Ds	
Orange-crowned warbler	*Vermivora celata*	OB	Sh, Gr	
Yellow warbler	*Dendroica petechia*	PR	Sh	
Yellow-rumped warbler	*Dendroica coronata*	OB	Sh	
Common yellowthroat	*Geothlypis trichas*	PR	Sh, Gr	
Wilson’s warbler	*Wilsonia pusilla*	PR	Sh, Gr	
Western tanager	*Piranga ludoviciana*	PR	Wm, Wo	
Black-headed grosbeak	*Pheucticus melanocephalus*	PR	Wm, Wo	
Lazuli bunting	*Passerina amoena*	CO	Sh, Ds	
Spotted towhee	*Pipilo maculatus*	CO	Ds, Gr	
White-crowned sparrow	*Zonotrichia leucophrys*	PR	Ds, Gr	
Song sparrow	*Melospiza melodia*	PR	Sh, Ds	
Dark-eyed junco	*Junco hyemalis*	OB	Sh, Ds	
Chipping sparrow	*Spizella passerina*	PR	Sa	
House sparrow[3]	*Passer domesticus*	OB	Ds	
Brown-headed cowbird	*Molothrus ater*	CO	Ds, Gr	
Red-winged blackbird	*Agelaius phoeniceus*	CO	Sh, Ds	
Bullock’s oriole	*Icterus bullockii*	CO	Wo, Wm	
Purple finch	*Carpodacus purpureus*	PR	Ds, Sh	
House finch	*Carpodacus mexicanus*	OB	Ds	
American goldfinch	*Carduelis tristis*	PR	Ds, Gr	

1 Breeding Status Codes: OB=Observed; PO=Possibly breeding; PR=Probably breeding; CO=Confirmed breeding.

2 Primary Habitat Type(s): Ds=Disturbed; Gr=Grassland; OW=Open water; Sa=Savanna; Sh=Shrubland; Wm=Woodland-mixed; Wo=Woodland-oak.

3 Non-native species.

Mammals

No systematic surveys were conducted for mammals. The complexity of inventorying such a diverse class of wildlife made the task prohibitively expensive. However, surveyors did record direct observations of live and dead mammals made during the course of other fieldwork. Indirect signs such as fecal pellets, tracks, and tree stems cut by beavers that could be identified to a species were also recorded. Bats were observed during late evening pond turtle surveys in the summer of 2007. However, no attempt was made to identify the species observed. Mammal species directly or indirectly observed are listed in Table 3.

Table 3. Mammalian species known to occur at Newton Creek Wetlands. None of the species observed are designated as state or federal threatened/endangered, USFWS species of concern, or ODFW strategy species.

Common Name	Scientific Name
Trowbridge's shrew	*Sorex trowbridgii*
Eastern cottontail	*Sylvilagus floridanus*[1]
Brush rabbit	*Sylvilagus bachmani*
California ground squirrel	*Spermophilus beecheyi*
American beaver	*Castor canadensis*
Deer mouse	*Peromyscus maniculatus*
Dusky-footed woodrat	*Neotoma fuscipes*
Vole (unknown species)	*Microtus* spp.
Nutria[1]	*Myocastor coypus*[1]
Coyote	*Canis latrans*
Common raccoon	*Procyon lotor*
Black-tailed deer	*Odocoileus hemionus columbianus*

[1] Non-native species

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III. Wildlife Habitat Types

In this report, the usage of the term, *wildlife habitat type*, follows that of O'Neil and Johnson (2001)—a group of vegetation or land use cover types determined by a similarity of wildlife use. The concept is based on the long recognized understanding that certain assemblages of wildlife species tend to be associated with landcover types that possess particular attributes of physical structural and plant composition, presumably because wildlife species are best able to satisfy their life requisites in these conditions. The term, *wildlife habitat type*, is not synonymous with, *habitat*,--the unique set of resources used by a single species for meeting its need for food, water, cover, and reproduction.

Seven wildlife habitat types were classified for purposes of conservation planning at Newton Creek Wetlands (Table 4). Wildlife habitat types were determined by simplifying

a classification and map of 24 vegetation types prepared by Salix and Associates according to observations of wildlife communities at Newton Creek Wetlands. Wetlands and uplands were not classified as different habitat types because observations indicated that wildlife communities at Newton Creek Wetlands were indistinguishable along this environmental gradient. Seasonal flooding and saturated soils are so widespread throughout the study area that animals that avoid wetlands do not occur in the area. Even wildlife that are most closely associated with wetlands (e.g. rough-skinned newts, Canada geese) were observed at the highest elevations of Newton Creek Wetlands.

The resulting map of wildlife habitat types is presented in Figure 2. Descriptions of each wildlife habitat type are provided below.

Table 4. Relative areas of seven wildlife habitat types classified at Newton Creek Wetlands.

Habitat Type	Relative Area (%)
Grassland	8
Savanna	3
Shrublands	32
Woodland/mixed deciduous	6
Woodland/Oregon white oak	3
Disturbed	40
Open Water	8

Grassland

The grassland wildlife habitat type was created by merging seven different wetland, upland, and disturbed grassland or prairie vegetation classes. The resulting habitat type comprises conditions that range from reed canarygrass marsh, to small patches of tufted hairgrass prairie, to highly disturbed areas of herbaceous vegetation.

The total area of grassland at Newton Creek Wetlands is 17.6 acres. The largest discrete patch of grassland is 9.9 acres. Wildlife species that were commonly observed in grasslands at Newton Creek Wetlands were the common garter snake, Wilson snipe, white-crowned sparrow, American goldfinch, white-footed deer mouse, and Columbian black-tailed deer.

The two most significant wildlife management issues for the grassland habitat type are 1) non-native, invasive plants, and 2) possible predation of native wildlife by domestic and feral cats. Ground-nesting birds of the Willamette Valley are best adapted to native prairie and savanna plant communities. There is some evidence that vegetation structure associated with bunchgrass habitat types is preferred by songbirds such as the western meadowlark and vesper sparrow. Northwestern pond turtles often select nest sites in small patches of bare ground between bunchgrasses. Turf-forming grasses may exclude

pond turtle nesting. Grasslands dominated by non-native grasses and other herbaceous species are probably less suitable for most prairie-associated wildlife.

Cats were observed in the vicinity of Scout Pond twice during 2007. Domestic and feral cats represent one of the most serious threats to shrub- and ground-nesting birds. A free-roaming domestic cat typically kills 0.7 to 1.4 birds per week (Lepczk et al. 2004). Migratory bird species are most at risk to predation by cats (Wilcove 1985). The presence of cats in Newton Creek wetlands poses a risk of creating a "sink habitat". That is, breeding pairs of migratory birds attracted to high quality habitat on the site may experience a higher rate of mortality than rates of survival and recruitment, causing a net population loss. Any area being managed for native wildlife diversity should be surveyed for domestic cats and, if necessary, a trapping program initiated.

Savanna

Savannas are plant communities dominated by grasses and forbs, but with widely scattered individual or small clusters of trees. Savannas may be relatively stable communities on xeric sites where vegetation is dominated of drought-tolerant grass and tree species. Savanna communities may also arise as a transitional stage in succession where trees are able to colonize grasslands from which they were previous excluded by the physical condition of the site or its disturbance regime.

The savanna habitat type was created by merging two vegetation types, savanna/wetland and savanna/transitional, that were classified by Salix and Associates.

At Newton Creek Wetlands, savannas are a minor component of the landscape. The habitat type is restricted to two small wet/mesic sites with a total area of 5.7 acres (Fig. 2). Both patches are dominated by non-native grasses/forbs with scattered Oregon ash and Suksdorf's hawthorn. The composition of wildlife assemblages observed in the savanna patches not significantly different than adjacent habitat types. Common wildlife species observed in savannas were the western scrub-jay, spotted towhee, and many of the species that were detected in grasslands or disturbed areas.

Wildlife management issues in the savanna habitat type are the same as in grasslands.

Shrublands

Shrublands comprise the second most extensive habitat type at Newton Creek Wetlands with a total area of 68.2 acres. Some of the largest shrubland patches are homogeneous stands of Hooker's willow occurring on seasonally flooded wetlands. The largest of these patches is >20 ac. Other shrublands are dominated by Oregon ash saplings, non-native Armenian blackberry, or mixed species. Smaller patches of shrubs are also scattered throughout disturbed areas.

Shrubs are an important resource for many wildlife species. Shrubs are used for hiding or thermal cover by animals, are a direct source of food for herbivores, and provide habitat

for invertebrates—another source of food for many higher-order wildlife. Shrubs are also utilized by many birds for nesting. There are a large number of wildlife species that demonstrate a close association with shrublands and/or the understory shrub layer in woodland habitat types. At Newton Creek Wetlands, shrub-associated wildlife include the willow flycatcher, Wilson's warbler, yellow-rumped warbler, brush rabbit, and common raccoon. Northwestern pond turtles were frequently observed near the edges of flooded wetlands dominated by willows. It is suspected that the extensive, shrubby wetlands may be important breeding habitat for red-legged frogs, an ODFW Strategy Species. However, the dense willow stands were impenetrable to surveyors and the species was not detected. The vegetative structure of shrublands appears to be a more important determinant of wildlife use than plant species composition. Even non-native, woody plants such as Armenian blackberry are used for cover and food by a wide range of wildlife.

The most important shrubland management issue is, from a wildlife conservation perspective, deciding how to balance the amount and distribution of shrubs with more rare habitat types. Grasslands and savannas are among the most imperiled plant communities in the Willamette Valley, on which several habitat "specialists" such as the vesper sparrow and streaked horned lark are dependent. However, the structural complexity of shrublands provide a greater variety of habitat resources and correspondingly richer wildlife communities. Newton Creek Wetland natural resource managers will need to decide how to balance the needs of rare grassland species, while maintaining overall wildlife diversity.

Shrub-nesting birds are vulnerable to predation by domestic and feral cats. Monitoring the number of cats that are present at Newton Creek Wetlands is recommended, and controlling cat populations should be considered if necessary to maintain wildlife diversity at the site.

Woodland/Mixed Deciduous

The woodland/mixed deciduous habitat type was created by merging four forest types primarily distinguished by plant communities along a riparian-upland gradient. All four forest types are characterized by mixed tree species composition, closed canopies, and dense understory vegetation. At riparian and wetland sites, woodlands were dominated by Oregon ash, black cottonwood, and/or white alder. At transitional and upland sites, canopies were a mix of Oregon ash, Sukdorf's hawthorn, and Oregon white oak. Observations at Newton Creek Wetlands indicated that vertebrate communities didn't differ significantly among these forest types.

The total area of the woodland/mixed deciduous habitat type at Newton Creek Wetlands is 12.5 acres. The largest discrete patch of mixed woodland is 4.6 acres. Although the minor amount and fragmented pattern of woodland at Newton Creek Wetlands precludes much of the wildlife diversity often observed in larger patches of this habitat type, these small stands are an important component of the landscape. Wildlife species that conduct most of their activities in more open areas will use woodlands as hiding or thermal cover.

Examples include coyotes and black-tailed deer. Red-tailed hawks and American kestrels were often observed perched in trees at the edge of these stands while they were hunting for voles and rabbits in adjacent grasslands. Other wildlife species commonly observed in this habitat type were the rough-skinned newt, song sparrow, evening grosbeak, and white-footed deer mouse. Stick houses of the dusky-footed woodrat were frequently observed in deciduous woodlands.

Woodland/Oregon White Oak

The woodland/Oregon white oak habitat type was created by separating oak stands from other deciduous forest types classified by Salix and Associates.

There are two patches of Oregon white oak woodlands in close proximity to each other on the west side of Newton Creek Wetlands (Figure 2). The total area of this habitat type is 6.0 acres. Most of the dominant trees have tall stems and narrow crowns, a structure that is characteristic of oaks grown in a woodland setting. These trees probably originated between 1860-1900. There are a few oaks with open grown structure (i.e., major branches low on the stem, full crowns) imbedded within these stands that probably originated much earlier. Prior to European settlement, annual fire setting by Native Americans in the Willamette Valley created extensive tracts of oak savanna and prairie. The wide tree spacing permitted oaks to develop their characteristic, open structure. The understory of the oak woodlands at Newton Creek Wetlands is relatively simple with only a grass/forb layer and scattered tall shrubs.

Oregon white oak savannas and woodlands were major habitat types across the Willamette Valley landscape prior to European settlement. Oak plant communities are used to some degree by more than 200 species of wildlife (Campbell 2004). A few species such as the acorn woodpecker, slender-billed nuthatch, and western gray squirrel have particularly close associations with oak habitats. Today, oak woodlands and savannas are being lost to development, increasingly intensive management practices on agricultural lands, and to encroachment by conifers.

Two ODFW Strategy Species, the acorn woodpecker and slender-billed nuthatch are resident in the oak patches at Newton Creek Wetlands. Other species frequently observed in these stands were the southern alligator lizard, common garter snake, ring-necked snake, mourning dove, acorn woodpecker, slender-billed nuthatch, and European starling. A female Northwestern pond turtle captured in Scout Pond and radio-tagged during the summer of 2007 was tracked to the oak woodlands in December. She moved her position within these woodlands at least twice during the winter, spending more than five weeks in an underground burrow just west of the old planning mill.

Many dominant oaks at Newton Creek Wetlands are showing indications of crowding, such as death of major branches and narrow crowns. Silvicultural intervention is recommended to maintain the health and habitat suitability of these woodlands. The open grown oaks that originated prior to European settlement should receive the highest management priority. Some of the these legacy trees still have relatively full crowns and

are the individuals most likely to respond vigorously to release treatments. Removing all competing trees within a radius equal to the height of the retained tree should promote continuing growth of the tree crown. Among the younger cohort of oaks, trees with the fullest crowns should be identified and also receive release treatments. All other portions of the stands would benefit by lowering the density of dominant trees with a thinning treatment.

Disturbed

Disturbed areas comprise a greater portion of landcover than any of the more natural habitat types at Newton Creek Wetlands. This is not surprising given the history of industrial developments at the site. The total area classified as disturbed is 85.9 acres. The disturbed habitat type has been used to distinguish portions of the landscape that have been most severely impacted by soil compaction, fill, alterations to the natural topography, and encroachment by non-native, woody plant species. The site of the abandoned mill, the road network, log storage decks, and dikes are locations where the impacts of past land uses are most apparent.

The structure and composition of vegetation is highly variable across disturbed areas. Roadbeds and log decks near the northeast portion of the property are dominated by non-native grasses and forbs. The ground cover near the abandoned mill site and log decks to the west is characterized by gravel fill, broken concrete, and disturbed soils with relatively sparse vegetation. Patches of non-native shrubs (e.g., Armenian blackberry, Scotch broom) are scattered throughout most of the disturbed areas and are extensive along the impoundment dikes.

Wildlife use of disturbed areas is surprisingly high. Roadbeds and areas of bare, scarified soil provide openings within the surrounding matrix of wetlands and woodlands. Lizards and snakes were frequently observed basking or hunting in these bare areas. There is strong evidence that the old log deck and processing area north of Scout Pond is an important nesting area for Northwestern pond turtles (See Attachment I). Dozens of bird species were observed using the thickets of Armenian blackberry. Species that were frequently observed in disturbed areas were the common garter snake, Northwestern garter snake, gopher snake, California quail, killdeer, dark-eyed junco, white-crowned sparrow, brush rabbits and California ground squirrel. Coyote scats were common along roadbeds, suggesting the species is using the network of abandoned roads as travel corridors for that species.

Approximately 40% of the total landcover at Newton Creek Wetlands is classified as disturbed. Although disturbed areas are being used by a large number of wildlife, the species detected in this habitat type (with a few exceptions) are habitat “generalists” that can thrive in a broad range of environments and are common across the surrounding landscape. Wildlife species most at risk in the Willamette Valley are those exhibiting narrow habitat preferences, usually with a habitat type that has become rare in the region. Restoring more natural grasslands, oak savannas, and woodlands at Newton Creek Wetlands would most likely benefit wildlife most in need of population recovery.

Open Water

The three major ponds at Newton Creek Wetlands (i.e., Scout, North, and Berm) are legacies that remain from the extensive log ponds created by the Clemens mill operation. Prior to the construction of the mill, the habitat types within impounded areas were most likely small palustrine wetlands, wet prairie, and upland prairie. The only permanent, open water was likely to be the active channel of Newton Creek. Based on an analysis of historic photos, the maximum area of the original mill impoundments may have been greater than 50 acres. The dikes were deliberately breached to drain the log ponds when mill operations ceased. Beavers have colonized Newton Creek Wetlands in recent years and have dammed the dike breaches, flooding the lowest areas of the original impoundments (Fig. 2). The total surface area of the three major ponds varies seasonally, but the maximum extent of open water in spring is approximately 18 acres.

The three ponds support a great diversity of wildlife. Sixteen species of waterfowl, shorebirds, and raptors were observed using the ponds during visits in 2007-08. Other common native wildlife detected in/on the ponds were the rough-skinned newt, Pacific tree frog, Northwestern pond turtle, common garter snake, and American beaver.

Three significant management issues were identified during observations made on the ponds. First, bullfrogs and introduced warm-water fish are pervasive throughout the ponds. Native aquatic wildlife such as red-legged frogs and Northwestern pond turtles are not well adapted to these introduced predators. ODFW biologists (ODFW 2006) and scientists (Holland 1994) report that bullfrogs and introduced fish pose a serious threat to native amphibians and turtles. Unfortunately, there are no straightforward solutions to the problem at present. About the only recommendation that can be made is for conservation planners at Newton Creek Wetlands to remain aware of advances in control methods for bullfrogs and warm-water fish by researchers and wildlife management agencies.

The second pond management issue is the presence of a large amount of plastic sheeting adrift in Scout Pond. The sheeting was originally placed on the bed of the pond to eradicate an invasive weed (pers. comm. J. Mitchell). Torn plastic now billows through the water column during winter and spring. There are many places in the pond where it appears possible for turtles and other aquatic vertebrates to become trapped within the plastic sheeting. Removing this hazard while it remains in relatively large pieces will be much less time-consuming than after UV radiation causes the plastic to weaken and fragment into many small pieces.

The final pond management issue is a concern that previous industrial activities may have introduced contaminants into the environment and pose a risk to the wildlife inhabiting ponds and wetlands. Level I and II environmental assessments were conducted at some sites in Newton Creek Wetlands in 1995 and no contaminants were reported in ground water (pers. comm., Karen Fleck-Harding). However, it is unclear whether these assessments sampled surface waters. Given the substantial investments that are being

considered to restore native habitats at site, testing for water contaminants seems a prudent measure to protect wildlife and human visitors.

Although the three ponds were created by previous industrial activities, they now provide a valuable type of habitat that is uncommon in the surrounding landscape. Property owners and their conservation planners must balance the value of ecological functions provided by the existing ponds with the potential benefits that could be achieved for threatened species of plants and animals if the ponds were to be restored to wet prairie.

IV. Managing Rare, Threatened, and Keystone Species

Clouded Salamander (*Aneides ferreus*)

Ecology- In Oregon, the clouded salamander is usually restricted to the Douglas-fir/western hemlock forest type. The species is particularly associated with two types of microhabitat: decaying logs and rocky outcrops. While the clouded salamander isn't considered an old-growth obligate, it often reaches high abundance in these stands because of the large amounts of coarse, woody debris on the forest floor.

The presence of the clouded salamander at Newton Creek wetlands is unusual (although not unprecedented) given the low elevation of the site and the distance to contiguous tracts of conifer forest. The author (D. Vesely) has confirmed discoveries of clouded salamanders at three different locations within Corvallis city limits. The most likely explanation for the occurrence of clouded salamanders at Newton Creek wetlands is that they were unintentionally transported to the site on logs delivered to the planing mill. The population has managed to persist in the large, decayed logs and deep piles of woody debris that still remain scattered across the site.

Conservation Status- The clouded salamander is listed as an Oregon state sensitive species (ODFW 1997) and an Oregon Conservation Strategy Species (ODFW 2006). The most important threat to the clouded salamander is forest practices on private, industrial forests that reduce the volume of large logs on the forest floor.

Mapping & Management Recommendations- Given that the population of clouded salamanders at Newton Creek wetland is likely the result of an accidental introduction and is isolated from the larger population inhabiting the Oregon Coast Range, undertaking special habitat management actions to maintain the species at the site is not recommended.

Northern Red-Legged Frog (*Rana aurora aurora*)

Ecology- Red-legged frogs are found in ponds, streams, ephemeral wetlands, and flooded ditches below 2700 ft (above sea level). Adults are also found in humid forests and valley floor woodlands during rain.

Red-legged frogs usually begin to congregate at breeding sites in January in the Willamette Valley. During late-February and early March, females deposit eggs in a globular mass attached to emergent vegetation such as a reed stem or stick. There is some experimental evidence that oviposition sites are preferentially selected where long, linear shadows are cast over water, such as those created by willow branches, cattails, or tall grass (Wiens 1970). Time to hatching is temperature dependent, occurring between 35-50 days after oviposition. The length of time until metamorphosis also is strongly influenced by water temperature and environmental factors. Adults prefer to remain on land during the day, but generally stay close to water to escape terrestrial predators.

A very high proportion of red-legged frog eggs and larvae are lost to native and non-native predators that include rough-skinned newts, bullfrogs, garter snakes, great blue herons, belted king fishers, raccoons, domestic cats, and many others.

Conservation Status- The red-legged frog is listed as an Oregon state sensitive species (ODFW 1997) and an Oregon Conservation Strategy Species (ODFW 2006). Threats include habitat loss (via development and overgrazing) and predation by introduced fishes and bullfrogs (Cook and Jennings 2001). Declines in the red-legged frog populations also have been attributed to UV radiation, airborne pesticides and disease (Davidson et al. 2001).

Mapping- No red-legged frog egg masses were detected after approximately 15 hours of search effort. There were many acres of suitable habitat that were unsurveyed because of the limited amount of time available for the effort. An adult red-legged frog was detected in the northern portion of the property during the summer of 2007, therefore it should be assumed that some areas of Newton Creek Wetlands are occupied by the species. Given the small size of aquatic features used for breeding by red-legged frogs, there are no aerial photographs or digital elevation model (DEM) coverages with sufficient resolution to allow reliable mapping of breeding habitat.

Management Recommendations- The extensive open water and wetland habitats appear to provide widespread breeding habitat for red-legged frogs across Newton Creek Wetlands. Ephemeral pools and seasonally flooded ditches are generally unsuitable for bullfrogs and may provided the best breeding habitat for red-legged frogs. The large patches of willows at Newton Creek wetlands offer highly suitable hiding cover and foraging habitat for adult frogs. If the existing population of beavers are allowed to continue maintaining dams constructed during the last several years, there appears little need for additional active habitat management.

While red-legged frogs do not appear to need human intervention to restore habitats at Newton Creek wetlands, two other factors linked to amphibian declines may be relevant to frog populations at the site. Non-native bullfrogs are abundant in all permanent ponds at Newton Creek wetlands. It is very likely the species is a significant predator of red-legged frogs at the site, but it is impossible to know the level of mortality that can be attributed to bullfrogs without intensive study. Bullfrogs are extremely difficult to eradicate from ponds and wetlands once they have established breeding population, but

bullfrog populations can be temporarily reduced in some habitats by collecting egg masses and adults and with hand nets, then destroying them. Other property owners have reported limited success after repeated days of shooting adults with a pellet gun while they are resting on pond banks. Recent research by the U.S. Geological Survey in Oregon suggests that predator-prey dynamics among native and non-native pond inhabitants affect mortality rates of native frogs. Their research suggests that dragonfly larvae cause significant mortality among bullfrog tadpoles when non-native, warm-water fish are absent from the aquatic system. However, when these fish are present, dragonfly larvae populations are reduced, consequently leading to greater numbers of bullfrog tadpoles. It still remains uncertain whether red-legged frog populations would increase if bullfrog numbers were reduced. There are many other very effective native predators of red-legged frogs.

Red-legged frogs and other amphibians are known to be vulnerable to direct mortality and teratological effects from exposure to environmental contaminants. The past and present industrial uses on properties in the vicinity of Newton Creek wetlands lead to the possibility that wildlife might be exposed to surface water or soil contaminants. Level I and II environmental assessments were conducted at some sites in Newton Creek Wetlands in 1995 and no contaminants were reported in ground water (pers. comm., Karen Fleck-Harding). However, it is unclear whether these assessments sampled surface waters

Northwestern Pond Turtle (*Emys marmorata marmorata*)

Ecology—The Northwestern pond turtle remains a relatively common inhabitant of large rivers and wetlands in the Willamette Valley. The species requires a mosaic of different aquatic and terrestrial habitats in relatively close proximity to complete all of its life requisite activities. Pond turtles are most often associated with slack-water habitats (e.g., alcoves, side channels) in riverine systems and large, permanently flooded lacustrine and palustrine wetlands. The species also uses reservoirs, flooded gravel pits, and stock ponds. Underwater vegetation is an important habitat element used for hiding cover. Emergent logs and rocks are another crucial habitat feature that are used by pond turtles for basking. Basking is an important thermoregulatory behavior that allows turtles to conserve energy.

Terrestrial habitats are also used by Northwestern pond turtles. The species nests in open, prairie-like habitats. Nesting sites are characterized by full exposure to the sun, sparse ground cover vegetation, and located above the average annual floodplain. Shrubby or woodland habitats are used for over-wintering by the species. Dispersal and migratory movements may also occur over land (Holland 1994).

Pond turtles nest on land between late-May and late-July in the Willamette Valley. Eggs hatch in late summer, but hatchlings may remain in the nest until the following spring (Holland 1994). Females excavate a nest chamber in fine textured soil (Holland 1994). Clutch size is usually between 8-10 eggs. Eggs and juvenile turtles have a low rate of survivorship. Annual survivorship between birth and year 3 is estimated to be approximately 10-15% (Holland 1994). Predators of eggs include skunks, raccoons, and

coyotes (Holland 1994). Hatchlings are preyed upon in the water by bullfrogs, large-mouth bass, garter snakes, great blue herons, and a large number of other vertebrates (Holland 1994).

Conservation Status—The Northwestern Pond Turtle has been designated as an ODFW Conservation Strategy Species and a USFWS Species of Concern. Western pond turtle populations have reportedly experienced range-wide declines (Holland 1994, NatureServe 2007). Threats include: loss and fragmentation of habitat, introduced fish and bullfrogs, illegal collecting, and traffic-related mortality (Holland 1994, NatureServe 2007).

Mapping—The Oregon Wildlife Institute conducted a pilot study of Northwestern pond turtle demography and movements at Newton Creek Wetlands during spring-summer 2007 (See Appendix I). Pond turtles were captured in all three of the major ponds at the site and were observed in a fourth pond (i.e., "Diamond Pond") on an adjacent property. Using radio-telemetry and a dog trained to detect pond turtles, it was found that individual turtles make frequent movements among the ponds. Two incomplete nests and an overwintering site used by a female were also discovered during fieldwork. Two areas having a high probability of being functioning nesting habitat are identified on Figure 3.

Management Recommendations—Northwestern pond turtles require different types of aquatic and terrestrial habitats to perform all of their life requisite activities. Ensuring the long-term persistence of the species at Newton Creek Wetlands will require landscape-scale conservation planning. Four primary management issues are identified below.

- Plastic Sheeting Hazard at Scout Pond-- Scout Pond contains thousands of meters^2 of plastic sheeting originally placed on its bed many years ago to eradicate an invasive weed. Torn plastic now billows through the water column. There are many places in the pond where it appears possible for turtles and other aquatic vertebrates to become trapped within the plastic sheeting. Removing this hazard while it remains in relatively large pieces will be much less time-consuming than after UV radiation causes the plastic to weaken and fragment into many small pieces.
- Managing Nesting Habitat—Northwestern pond turtles nest only in a narrow range of habitat conditions. The species requires a site above the annual floodplain, fine textured soils, relatively sparse grass/forb layer, full exposure to the sun, and within 200-300 ft of occupied aquatic habitat. Such a set of conditions is rare at Newton Creek Wetlands. Nevertheless, the 2007 demography and movement study identified two large areas containing small patches of suitable nesting habitat (Figure 3). Females were tracked into these areas during the nesting season in 2007 and two incomplete nests were discovered, lending evidence that these areas are being used for nesting. Maintaining these areas in suitable condition for nesting habitat should be among the highest wildlife management priorities on the properties. One of the nesting areas (north of Scout Pond) will become unsuitable for this purpose if the planted trees at this location are allowed to grow. It is recommended that both of the functioning nesting areas be maintained in open grassland conditions, preferably dominated by native

bunchgrasses. Since eggs and hatchling turtles remain underground for as long as nine months, soil-disturbing activities should be avoided in turtle nesting areas. The prairie-like conditions used by pond turtles for nesting also offer breeding habitat to a number of other wildlife species that are becoming extremely rare in the Willamette Valley such as vesper sparrows and Fender's blue butterfly.

- Managing Human Disturbance Near Centers of Turtle Activity –The new Boy Scout Center on the east side of Newton Creek Wetlands, and the Marys Peak Natural Resources Interpretive Center planned for construction on the west side are likely to greatly increase human presence and vehicle traffic in the area. Pond turtles are extremely wary of humans and individual turtles will abandon important activities such as basking, feeding, or nesting if they are disturbed. Maintaining a viable population of Northwestern pond turtles will depend upon buffering important activity centers such as basking logs and nesting areas from human approach. A June 1-July 15 seasonal restriction at nesting areas should be sufficient to protect females from human disturbance.
- Removing Pond Dikes—Removing the dikes that were constructed for log ponds is important step for restoring a more natural hydrological regime at Newton Creek Wetlands. Cutthroat trout, coho salmon, and other organisms that dwell in lotic habitats may benefit from such actions. However, the effects of dike removal on pond turtles are less clear. The existing topography, although shaped for an industrial purpose, probably has resulted in more extensive, permanently flooded wetlands than would occur naturally. Removing the dikes and restoring the natural grade of the site is likely to reduce habitat availability for pond turtles unless replacement ponds are deliberately planned.
- Basking Platforms—Emergent logs, rocks, and manmade objects provide basking platforms, a crucial habitat element used by turtles for thermoregulatory behavior. Scout and Berm Ponds contain numerous large logs that are a legacy from the mill that previously occupied the site. North Pond currently has few basking platforms and turtle would benefit by the placement of logs or artificial basking rafts.

American Bittern (*Botaurus lentiginosus*)

Ecology—The American bittern is an uncommon summer visitor to wetlands of the Willamette Valley. The species breeds in marshes with tall, emergent vegetation and shows a preference for impoundments created by beavers (Gibbs et al. 1991). Bitterns construct platform-type nests among dense, emergent vegetation, usually above water 3-8 inches in depth (Gibbs et al. 1992). Their diet has not been studied in Oregon, but is composed of insects, crustaceans, frogs, fish, and snakes elsewhere (Herziger and Ivey 2003).

Conservation Status—American bitterns are not included on federal or state lists of species with special status. However, the species is believed to have been previously more common in Oregon (Herziger and Ivey 2003). Taft and Haig (2003) estimate that 67% of Willamette Valley wetlands have been lost since European settlement. Thus, there is reason to be concerned for the avian species dependent on these habitats. Bitterns

may also be vulnerable to indirect effects of contaminants that run off from agricultural fields and are concentrated in prey such as invertebrates and frogs (Gibbs et al. 1992).

Mapping & Management Recommendations—Bitterns were observed visually on multiple occasions near the north shoreline of Scout Pond during June and July 2008 (Figure 4). There appeared to be a pair nesting among cattails and willows in this area. Bittern calls were also heard several times at a point on the south shore of North Pond and were probably from a different individual than those at Scout Pond (Figure 4). Given the presence and probable breeding of American bitterns at Newton Creek wetlands, management considerations for the species are recommended. Activities that benefit the species include: maintaining or enlarging areas of emergent wetlands, restricting recreational activities and other human disturbances around nesting/rearing areas during the breeding season (i.e., early-May to late-July). Given the industrial history of the site, an assessment of potential surface water contaminants is recommended.

Dusky Canada Goose (*Branta canadensis occidentalis*)

Ecology—The dusky Canada goose is one of 11 subspecies of *B. canadensis* in North America. The geographic range of dusky Canada geese is almost entirely restricted to the Copper River Delta in Alaska during the breeding season and the Willamette Valley during winter (Bromley and Rothe 2003). The population was estimated to be 20,000-25,000 in the early 1970's and the dusky was the most common of the subspecies occurring in the Willamette Valley (Bromley and Rothe 2003).

Most dusky Canada geese arrive in the Willamette Valley during early November (Jarvis 2003). Wintering habitat includes two major components: roosting areas primarily comprised of lakes, rivers and reservoirs; and foraging areas characterized by large expanses of grass or residue from grain crops (Jarvis 2003). Dusky Canada geese usually depart for their breeding grounds in mid-April (Jarvis 2003).

Conservation Status—The dusky Canada goose is listed by ODFW as a Conservation Strategy Species. Numbers had declined to between 12,000-15,00 individuals in the 1990's (Bromley and Rothe 2003) in spite of increased habitat availability on refuges at their wintering grounds (such as W.L Finley NWR). The causes of the population decline are due to complex, interrelated factors that include earthquake-mediated habitat changes on the species' breeding range, increasing rates of predation of eggs and chicks, and a 10-fold increase in other Canada geese subspecies in the Willamette Valley (Bromley and Rothe 2003).

Management Recommendations—The dusky Canada goose was not observed during 2007-2008 surveys at Newton Creek wetlands. The most common sub-species at the site appears to be the western Canada goose.

The recovery of the dusky Canada goose will depend on long-term, inter-regional conservation approaches beyond the scope of site-specific management actions.

Conservation planning is being lead by the Pacific Flyway Council and USFWS (Bromley and Rothe 2003).

Acorn Woodpecker (*Melanerpes formicivorus*)

Ecology—The acorn woodpecker is a locally common, year-round resident of the Willamette Valley. The species is closely associated with oak woodlands, but will utilize other nearby habitat types (Simmons 2003). Occupied stands often have park-like or pasture understory below a closed or semi-open oak canopy. The cessation of Native American fire-setting to prairies and woodlands in the Willamette Valley has caused previous savanna habitats to transition to closed-canopy oak woodlands, thus creating more favorable habitat for acorn woodpeckers (Droerge 1978).

As the name suggests, the diet of the acorn woodpecker is composed largely of oak mast, but also contains significant amounts of insects when they are available. Unlike most other woodpeckers, the acorn woodpecker primarily forages on insects by pursuing them in flight. Acorn woodpeckers live in colonies consisting of breeding individuals and non-breeding helpers. All members of a colony participate in collecting acorns and storing them in communal granaries—trees or other wood structures in which acorns (sometimes thousands of them) are fitted into individually drilled holes. Granaries are an extremely important resource for acorn woodpecker colonies, sometimes containing all the available food to supply a colony during winter months.

Eggs are deposited in tree cavities with an average inside diameter of 5.9 inches and averaging 27 ft above the ground (Koenig et al. 1995). Territories may contain multiple cavities, any of which may be used for nesting. Tree cavities are also used for roosting. All members of the colony participate in rearing young.

In Benton County, Oregon, The average number of individuals in an acorn woodpecker colony is 4.25; the maximum number of individuals observed is 8 (Simmonds 2003). Territory size is highly variable. In coastal California, territories averaged 14.8 acres (MacRoberts and MacRoberts 1976).

Conservation Status—Acorn woodpeckers have only recently arrived in the Willamette Valley. The species was first observed in Eugene in 1920 (Simmons 2003). The acorn woodpecker is listed as an Oregon Conservation Strategy Species by ODFW (ODFW 2006). Threats to the species continuing viability in the Willamette Valley include the loss of large Oregon white oaks and competition from European starlings for tree cavities (ODFW 2006).

Mapping—A colony of acorn woodpecker inhabits the Oregon white oak woodlands near the west boundary of the property. Individual woodpeckers have also been observed flying from these groves to oaks south of Philomath Blvd. The colony consists of at least 11 individuals. However, this count does not reflect a complete census of the colony. Thus the Newton Creek wetland colony is far larger than the maximum colony size reported by Simmon 2003. All of the oak groves on the Newton Creek wetland property

are being used by acorn woodpeckers. In July 2008, at least two different acorn woodpeckers were observed entering and leaving a cavity in a large oak. The area around this oak seemed to be the center of the colony's activities. These observations present strong evidence of breeding by acorn woodpeckers at Newton Creek wetlands. Sixty trees containing active or previously used granaries were counted in the oak groves. Granaries are most often located in dead branches on live Oregon white oak trees. Numerous tree cavities were observed among the colony's territory, although additional observations are necessary to determine which cavities are currently used for nesting and roosting. Current breeding and foraging habitat availability was mapped by delineating oak groves and mature, individual Oregon white oaks at Newton Creek wetlands.

Habitat for the acorn woodpecker was mapped for conservation planning purposes by delineating the oak groves where members of the colony were observed engaged in foraging, acorn gathering, or territorial defense (Fig. 5).

Management Recommendations—The acorn woodpecker colony at Newton Creek wetland is composed of at least 25% more individuals than have been counted at other colonies in Benton County. Ensuring the persistence of this group should be among the highest wildlife management priorities at the Newton Creek property. At present, the mature Oregon white oaks that stand on the site appear healthy and capable of providing abundant crops of acorns for the colony. However, the tree canopy across the oak grove has completely closed, with a large number of overlapping tree crowns. Dead branches are common on the oaks, indicating significant tree competition, which will only become increasingly severe as the trees grow.

In the absence of a significant natural disturbance event or silvicultural intervention, competition between oak trees will lead to physiological stress, slow growth, vulnerability to pathogens, branch die-back, and narrow tree crowns. A variable-density thinning program will promote full crowned, fast-growing oaks over much of the site. Large, open-grown oaks should receive the highest priority for preservation. Trees with full crowns maintain the greatest capability to respond to increased light and space that thinning will make available. Trees with "vase-shaped" crowns have limited potential for future growth. Dead branches are an important habitat element for acorn woodpeckers and other wildlife. They are excavated to create cavities for nesting and roosting, as well as providing foraging substrates for wildlife that feed on wood-boring insects. Allowing tree competition to become more acute in some small patches will foster the recruitment of dead branches.

The total area of occupied acorn woodpecker habitat on the property is 6 ac. Observations made at Newton Creek Wetlands indicate that acorn woodpeckers are using individual oaks and small groves in residential neighborhoods south of Philomath Blvd. However, increasingly intense land development in the area will almost certainly cause the attrition of oaks across the surrounding landscape. Furthermore, natural disturbance events and disease can be expected to eventually cause the loss of all the existing mature oaks on the Newton Creek wetlands property. To ensure continuing habitat availability for acorn woodpeckers and other wildlife, expanding the area covered by oaks at Newton Creek

wetlands should be considered. It will take decades for planted trees to attain the stature necessary to produce acorns. However, young groves could also be managed as native prairie or savanna plant communities until oak crowns begin to close far into the future.

Little Willow Flycatcher (*Empidonax traillii brewsterii*)

Ecology--The little willow flycatcher is a neotropical migrant that winters in southern Mexico and South America. Little willow flycatchers are usually associated with shrubby riparian areas, but are commonly observed in upland patches of shrubs in northwestern Oregon (Hagar, pers. comm.). The species is primarily an aerial insect forager, but occasionally will glean prey from plant leaves (Sedgwick 2000). Little willow flycatchers construct their nests close to the ground in shrub thickets. In the Willamette Valley, the species prefers to nest in vine maple, bracken fern, non-native Armenian blackberry and Scotch broom (Altman 2003). Territory size averages 1.1 ac in the Willamette Valley (Altman 2003).

Conservation Status— The species is listed as an Oregon state sensitive species (ODFW 1997) and an Oregon Conservation Strategy Species (ODFW 2006a). The most significant limiting factors to willow flycatcher populations are habitat loss and degradation (Remsen 1978, Sedgwick 2000). Land uses such as cattle grazing and forestry practices that reduce the abundance and diversity of shrubs in riparian areas appear to have the greatest negative impacts on willow flycatcher habitats (Remsen 1978, Hagar 2007). Nest parasitism by brown-head cowbirds greatly reduces the survival of willow flycatcher eggs and nestlings in some portions of the species' geographic range (Brown 1994, Harris 1991).

Willow flycatchers were detected in shrubby riparian areas and in the understory of Oregon white oak woodlands at Newton Creek Wetlands. Suitable habitat conditions for the species are widespread throughout the survey area. However, brown-head cowbirds were frequently observed during visits to the area and nest parasitism by the species may pose a significant risk to the breeding success of willow flycatchers.

Mapping-- Willow flycatchers were observed frequently at multiple locations along the shoreline of Scout Pond during turtle fieldwork during the summer of 2007. Current habitat availability was mapped by delineating areas dominated by *Salix* spp. or Armenian blackberry (Fig. 6).

Management Recommendations—Armenian blackberry and Scotch broom reportedly offer excellent nesting habitat for the willow flycatchers, although maintaining these invasive plants on the site is not recommended because of their capability to exclude important native species. The extensive patches of willows and other tall, native shrubs also offer suitable habitat at Newton Creek wetlands for willow flycatchers.

Two serious threats to little willow flycatcher populations across the species' geographic range are nest parasitism by brown-headed cowbirds and direct predation by feral cats. Cowbirds are common at Newton Creek wetlands. Cowbird control measures have been

attempted in California with limited success. Assessing the site-specific level of threat posed by cowbirds at Newton Creek wetlands would require an intensive breeding survey to determine the percentage of nests parasitised by cowbirds.

Slender-billed Nuthatch (*Sitta carolinensis aculeate*)

Ecology--The slender-billed nuthatch, a subspecies of the white-breasted nuthatch, is closely associated with mature deciduous trees throughout its geographic range. The species is an all-year resident in western Oregon. In the Willamette Valley, slender-billed nuthatches are most abundant in stands of large-diameter Oregon white oaks (Hagar 2007). The species gleans insects from bark furrows in tree stems and large branches. Nuthatches also cache seeds in bark furrows. Nests are constructed in tree cavities excavated by woodpeckers or created by decay (Pravosudov and Grubb 1993). Territories are large, typically 24-37 ac in woodlands, and even larger in semi-open habitats (Butts 1931).

Conservation Status—The slender-billed nuthatch is listed as a Conservation Strategy Species by ODFW because population indicators appear to be declining (ODFW 2006a). Breeding Bird Survey (BBS) data from the Willamette Valley indicate >50% decrease in abundance between 1970s and early 1990s (Hagar 2003). The primary factor limiting nuthatch populations in the state is reportedly the loss of mature oaks with which the species is closely associated (ODFW 2006).

Mapping—Slender-billed nuthatches were observed in Oregon white oak woodlands on the west side of the property numerous times during 2007 and winter 2008. Current habitat availability was mapped by delineating groves of Oregon white oaks (Figure 7). All of these groves were occupied by slender-billed nuthatches during 2007 and 2008, although nesting at Newton Creek wetlands was not confirmed.

Management Recommendations—Large-diameter oaks, particularly open-form trees, are a critical resource for slender-billed nuthatches. Nuthatches often nest in cavities found in dead branches on live trees and glean insects hiding in the deeply furrowed bark that is characteristic of mature oaks. Preserving large oaks and maintaining younger replacement trees will assure the availability of nesting and foraging habitat for slender-billed nuthatches. See management recommendations for acorn woodpeckers (p.23-24) for a further description of oak silvicultural treatments that will benefit wildlife in this habitat type.

Western Bluebird (*Sialia mexicana*)

Ecology—The western bluebird remains a fairly common year-round resident in the foothills of the Willamette Valley (Eltzroth 2003). The species breeds in open habitats (i.e., pastures, fallow fields, clearcuts) where suitable nest cavities or manmade nest structures are available. A study conducted in the Oregon Coast Range reported that the diameter of snags used for nesting average 28 inches (dbh); minimum diameter reported

is 9.8 inches (Schreiber and deCalesta 1992). The most significant causes of nestling mortality are predation, weather-related factors, and parasites (Guinan et al. 2000).

The western bluebird is primarily insectivorous, foraging on grasshoppers, crickets, spiders and *lepidoptera* larvae.

Western bluebird territory sizes were not available for Oregon. However, the average territory in an Arizona study was 1.06 acres (Balda 1967).

Conservation Status—The western bluebird is listed as a Conservation Strategy Species by ODFW because of habitat loss and declining populations (ODFW 2006a). The species was very common across the Willamette Valley until the 1940's (Eltzroth 2003). Factors that are reported to negatively affect western bluebird populations are: decreasing abundance of large snags on managed forests, fewer woodlots and large individual trees on intensively managed agricultural lands, and the expansion of house sparrow populations (a major nest site competitor).

Mapping—A pair of western bluebirds were observed near the nest boxes north of Scout pond for several days during June 2007. The pair left the area without defending a territory or nesting. Nesting habitat availability for western bluebirds was mapped by delineating oak woodlands known to have numerous cavities located in dead branches, as well as open fields with artificial nest boxes present (Fig. 8). Foraging habitats were mapped by delineating suitable fields (i.e., dominated by grass/forbs, few trees or shrubs) adjacent to breeding habitat (Fig. 8).

Management Recommendations—Western bluebirds would benefit from management practices that maintain suitable natural or artificial nesting structures. The oak woodlands at Newton Creek wetlands offer an abundance of suitable cavities that have been excavated by woodpeckers in dead oak branches. However, bluebirds are likely to be excluded from nesting in these areas by competitors such as acorn woodpeckers and European starlings. Nest boxes designed especially for western bluebirds can exclude most nest site competitors and have been crucial for re-establishing bluebird populations across the Willamette Valley.

Chipping Sparrow (*Spizella passerina*)

Ecology—The chipping sparrow occurs in scattered, localized populations throughout the Willamette Valley during the spring and summer. The species is commonly observed during migration, but rarely seen during winter in the region. Chipping sparrows are most common in large openings within conifer forests (e.g., clearcuts), forest edges, open woodlands, savannas (Scheuering 2003). Closed-canopy forests are avoided. Nests are constructed 1-3 m above the ground, usually in a small conifer or shrub (Middleton 1998). Territories range in size from approximately 0.5 ac to 2.5 ac (Middleton 1998).

Conservation Status—The chipping sparrow is classified by ODFW as a Conservation Strategy Species (ODFW 2006a). Analysis of BBS data indicate a declining trend in

detections of the species during 1966-2000 (Scheuering 2003). Reported causes for the decline in chipping sparrow populations are: loss of open oak woodlands in the Willamette Valley, alteration of historic fire regimes, cowbird brood parasitism, and predation by domestic cats (Scheuering 2003, ODFW 2006a).

Mapping—The complex mosaic of woodland and open habitat types that characterizes the Newton Creek Wetland landscape appears to provide extensive habitat for the chipping sparrow. An individual male chipping sparrow was observed approximately 400 ft to the southeast of the old planing mill building. Potential habitat for chipping sparrows was delineated by mapping deciduous woodlands, grasslands, and edges between these habitat types (Fig. 9).

Management Recommendations—Chipping sparrows would benefit from management practices designed to maintain or create savanna and open oak woodland habitats large enough to accommodate multiple territories. Controlling feral cats would likely improve survival rates of nestling and fledgling birds.

Western Gray Squirrel (*Sciurus griseus*)

Ecology—In Oregon, the western gray squirrel occurs throughout the Willamette Valley, southwest Oregon, the Columbia Gorge, foothills of the western Cascades, and lower elevations of the eastern Cascades. The species is especially associated with *Quercus* communities, but also inhabits conifer/hardwood forests. At Fort Lewis (in western WA), squirrels were most often observed in oak-conifer ecotones (Ryan and Carey 1995). The western gray squirrel is one of the most arboreal mammals in the Northwest and the species prefers woodlands with closed or semi-closed tree canopies (Ryan and Carey 1995). The diet of the western gray squirrels is largely composed of hypogeous fungi, acorns and other nuts (Verts and Carraway 1998). Tree cambium, berries, and plant buds are minor components of the diet (Verts and Carraway 1998).

Home ranges of western gray squirrels vary between 0.3 and 42 acres, but much of this variation is due to differences among methods of determining home range size across different studies (Ryan and Carey 1995). Ryan and Carey (1995) suggest that a minimum of 5 acres is probably necessary to support long-term occupancy.

Western gray squirrels are active throughout the year. Females give birth between December and September in Oregon (Ryan and Carey 1995). Dreys (nests) may be constructed in conifer or hardwood trees (Verts and Carraway 1998). Tree cavities are used for sleeping or hiding outside of the breeding season (Verts and Carraway 1998).

Predators of western gray squirrels include hawks, owls, bobcats, cats, coyotes, dogs, and American martens (Ryan and Carey 1995, Verts and Carraway 1998). The species is classified as a game animal in Oregon. Between 1969-1981, the total harvest of western gray squirrels was reported to be 314,383 individuals (Verts and Carraway 1998). Population densities fluctuate dramatically, usually in response to outbreaks of disease or parasites (Verts and Carraway 1998).

Conservation Status—The species is classified by ODFW as a Conservation Strategy Species, as well as a game animal. Factors limiting western gray squirrel populations include habitat loss and fragmentation due to development, predation by domestic cats, changes in woodland structure due to fire suppression in the Willamette Valley, and road-related mortality (Verts and Carraway 1998, ODFW 2006a).

Mapping—No western gray squirrels were observed during 2007-08 surveys at Newton Creek wetlands. The oak woodlands on the property provide approximately six acres of suitable habitat for the species, in a landscape dominated by human developments and unsuitable semi-natural landcover types. Busy public roads to the south and west of the property decrease habitat connectivity for squirrels between Newton Creek wetlands and other woodland patches in the surrounding landscape.

For planning purposes, habitat availability for western gray squirrels was mapped by delineating oak woodlands on the property (Fig. 10).

Management Recommendations—Western gray squirrels would benefit from silvicultural interventions designed to maintain large-diameter Oregon white oaks and expand the area of oak woodlands at Newton Creek wetlands. However, suitable woodland habitat in the surrounding landscape is so fragmented, it may take years for squirrels to discover and occupy the small, relatively isolated habitat patches on the property.

American Beaver (*Castor canadensis*)

Ecology—The beaver is always associated with wooded riparian or lacustrine habitats. Alders, willows, cottonwoods, and maples are trees preferred by beavers (Verts and Carraway 1988). Beaver are especially productive along streams that meander through flat terrain (Verts and Carraway 1988). Diets vary seasonally. Herbaceous vegetation, particularly water plants such as waterweed (*Elodea*) and water-lily (*Nuphar*) compose most of their summer diet; bark, twigs, and leaves of woody plants are eaten in winter (Verts and Carraway 1988).

Beavers live in colonies composed of family groups that include a breeding pair, yearlings, and young of the year (Verts and Carraway). All but the youngest members of a family contribute to food-gathering and dam construction activities.

The ability of beaver to cut down trees that are used for construction of dams and lodges is well known. Dams can be more than six feet high and hundreds of yards in length, but are generally much smaller in Oregon. Beavers construct dams to flood adjacent wooded riparian habitats so that they may move and transport food throughout their home range more easily. Where beavers build stick lodges, the impounded waters submerge the entrance to the lodge and make access more difficult for predators. Beaver ponds have been demonstrated to provide an important habitat feature used by coho salmon and cutthroat trout, as well as many other wildlife species. Sediments deposited behind beaver

dams eventually transform the impoundment into a wet meadows and alter the course of stream. Beavers adjust their dam-building activity in response to channel dynamics. The interaction between animal and stream results in a complex mosaic of wetland habitats. In constrained stream reaches where water levels vary dramatically in different seasons, beavers construct lodges by tunneling into stream banks.

The keystone ecological role played by the beaver has long been recognized by land managers. Bailey (1936) provided a 1930 report by an eastern Oregon district forester that stated, “The number of beaver in the state has been reduced almost to the vanishing point and this has affected stream flow, fish, grazing, and erosion to a serious degree. The beaver dams originally held back the run-off on the heads of streams, supplying the irrigation sections of eastern Oregon. The dams are now gone. The dams originally formed rearing ponds for the small fish and helped to restock the streams.”

Conservation Status—The earliest European exploration of the Pacific Northwest was primarily driven by the quest for beaver pelts. But early trappers quickly extirpated the species from extensive areas in Oregon. Beavers were reported to be plentiful along the Willamette River before 1817, but in 1824 David Douglas found the species to be scarce in the region (Bailey 1936). Beginning in 1893, beaver trapping was gradually prohibited county by county until the entire state was closed in 1932 (Verts and Caraway 1988). By 1945, beaver populations had rebounded to such a degree that between 3,000-6,000 nuisance beavers were removed during the mid-to late-1940’s (Verts and Carraway 19880). Since the 1950’s, regulated beaver trapping has fluctuated greatly in response to fur prices.

Mapping—Locations of beaver dams and lodges were mapped by the River Design Group, Inc. during topographic surveys of Newton Creek wetlands (Figure 11). Beavers have constructed dams at all of the major breaches that were excavated into the dikes when they were no longer needed to maintain the log ponds after mill operations ceased. Beaver activity has been the primary force behind the creation of wetlands currently existing at the site.

Management Recommendations—A beaver colony should be able to persist at Newton Creek wetlands without direct habitat management as long as their basic requirements for water and woody vegetation are satisfied. Beavers are sensitive to human presence and there is a risk that recreational or educational activities in close proximity to beavers will cause the animals to interrupt food gathering, rearing, or dam construction. Frequent disruptions may lower the productivity of the beaver colony. Land managers at Newton Creek wetlands should ensure that beaver activity areas such as dams and lodges are buffered from human disturbance.

Given the capacity of beavers to modify their environment, there is an opportunity to engage the colony in further restoration of stream and riparian habitats at Newton Creek Wetlands. Removing unneeded dikes and restoring the original grade would create areas for more natural landcover types. Subsequent beaver activity such as tree cutting, dam

building, and channel deepening could help re-establish a more natural hydrological regime at the site and promote the development of new wetlands and wet prairie habitats.

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Oregon Wildlife Institute

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VI. Figures

The file size of the maps (Figures 1 –11) precluded them from being inserted into this report. The maps are available as individual portable document files (.pdf) from the Marys River Watershed Council and the Oregon Wildlife Institute.

Attachment I

Population Demography and Movement Patterns of the Northwest Pond Turtle in the Willamette Valley, Oregon: 2007 Pilot Study

By

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Oregon Wildlife Institute
Corvallis, Oregon

Introduction

The Northwestern pond turtle (*Emys marmorata marmorata*) was previously common throughout western interior valleys of Oregon. In recent years, Northwestern pond turtle populations have declined in numbers and distribution and the species has been designated a Strategy Species by the Oregon Department of Fish and Wildlife (ODFW 2006). Contributing to population declines are: habitat loss and degradation, predation of eggs and juvenile turtles by native and exotic wildlife species, flood control practices, and illegal collection of turtles (ODFW 2006, Holland 1994).

The Oregon Wildlife Institute (OWI) is collaborating with a number of partners that are undertaking research and educational activities that we hope will help ensure the long-term persistence of the Northwestern pond turtle populations in the Willamette Valley of Oregon. In 2007, we began a pilot study for a multi-year investigation of pond turtle demography and movement patterns. The purpose of this research is to improve the understanding of species' population structure and landscape-level patterns of habitat use in the region. Our ultimate goal is to address information needs of conservationists working toward the recovery of Northwestern pond turtle populations. We established three objectives for the 2007 pilot study.

- Develop and evaluate capture methods, telemetry systems, and nest search procedures.
- Characterize population structure and movement patterns of females at one or two sites.
- Develop a protocol for efficiently detecting turtle nests at sites that have not been previously searched and where it is yet unknown whether the site is used by turtles for oviposition.

The primary purpose of the pilot study was to test and refine data collection procedures and analytical methods that will be used in our long-term program of research and monitoring. An important secondary purpose was to assist the Mary's River Watershed Council (MRWC), the Mary's Peak Natural Resources Interpretive Center (MPNRIC), and Boy Scout Troop 161 in their conservation efforts for Northwestern pond turtles.

Site Description

We conducted the pilot study in the Newton Creek subwatershed at a 65 ha site locally known as the Newton Creek wetlands. A lumber mill was once located on the property, but the facility was closed decades ago. Dikes that were constructed to create log-holding ponds for the mill still stand largely intact, but were deliberately breached and the ponds emptied when mill operations ceased. In recent years, beavers (*Castor canadensis*) have occupied the site and have dammed some of the breaches creating a mosaic of palustrine wetlands and three impoundments named Scout, North, and Berm ponds (Figure 1). We also tracked turtles to a fourth artificial pond (we named Diamond Pond) located at an active lumber mill at the northern end of the study area.

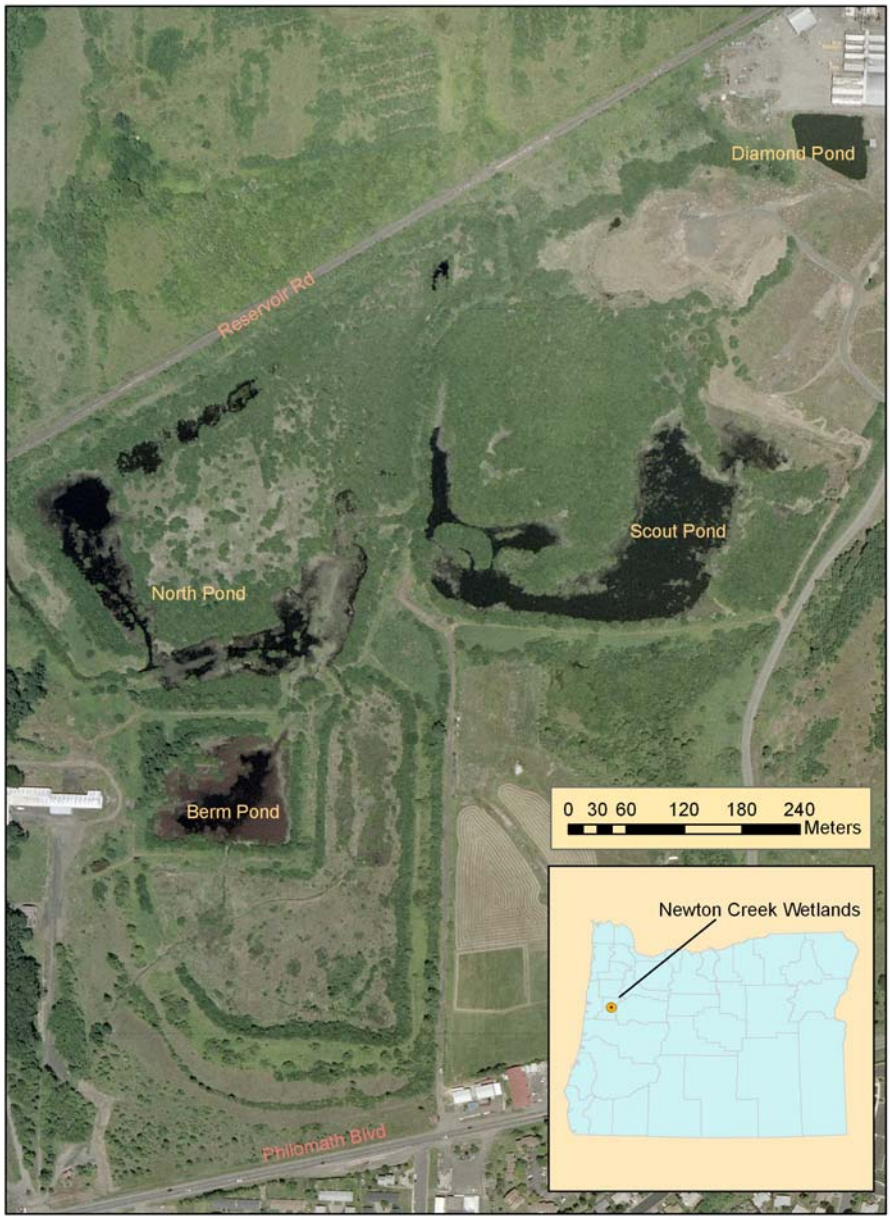

Figure 1. Newton Creek wetlands, Benton County, Oregon. 2005 digital orthophoto quad courtesy of Benton County GIS.

Scout, Berm and North Ponds have an abundance of emergent logs that are used by turtles for basking and we assume that sunken logs remaining in these impoundments provide good underwater hiding cover. Scout Pond contains thousands of meters^2 of black plastic sheeting placed on the pond bottom several years ago to control an invasive aquatic weed. The project has apparently been abandoned and the plastic sheeting tends to capture gas from decomposing organic matter and aquatic plants, billowing into the water column and floating on the water surface.

The landscape surrounding the ponds is dominated by shrubby wetlands, grasslands composed of introduced plant and native species, scattered patches of Oregon ash (*Fraxinus latifolia*) and black cottonwood (*Populus trichocarpa*), extensive areas of non-native blackberry thickets, gravel roads, and bare ground. Soils across most of the study area have been disturbed by excavation, off-site fill, and compaction from heavy equipment.

Ecology classes from a local high school have performed informal observation of turtles at Newton Creek wetlands for several years prior to our pilot study. The ecology teacher informed us that he believed there are at least 50 Northwestern pond turtles inhabiting the three main ponds. We had no previous information about turtle nesting activity in the study area. There are several open grasslands in the vicinity of the ponds that appeared to have some characteristics of Northwestern pond turtle nesting areas (i.e., above annual floodplain, unshaded, sparsely-vegetated). However, we were uncertain whether the disturbed soils in these areas were suitable for oviposition.

Our original study plan indicated that we would collect turtle population data and perform conservation activities at a replicate site near Wren, Oregon. However, we found that we did not have sufficient personnel and equipment to perform the necessary work at two widely spaced locations. Therefore, we decided to concentrate our efforts at Newton Creek wetlands because of its larger population of Northwestern pond turtles.

Methods

Capture and Marking

We used two types of floating traps for capturing turtles: a rigid, box-type design constructed of wire screen, and collapsible Applegarth traps. The tops of traps were elevated above water, permitting turtles to surface for breathing. We used a variety of canned and frozen fish as bait. Traps were placed near emergent logs, along channels, and near flooded patches of willows where we assumed turtles would congregate.

Trapping was conducted from April 26 to May 15, 2007 using 13 traps of the two designs. Traps were checked for captured turtles once per day. The positions of traps were alternated among 40 different locations in the three major ponds (Figure 2), according to turtle activity we observed during the trapping period.

Each captured turtle was marked in two ways to facilitate reobservation and identification. Turtles were non-permanently marked by applying five dots of white nail polish to the carapace. The purpose of the marks was to allow us to distinguish captured from not-captured individuals during surveys of basking turtles and facilitate an assessment of trapping success. Each turtle was also given a unique, permanent mark by filing a triangular notch into one or more marginal scute. Each scute was assigned a specific number (or range of numbers) according to a standardized code developed for this specific purpose.

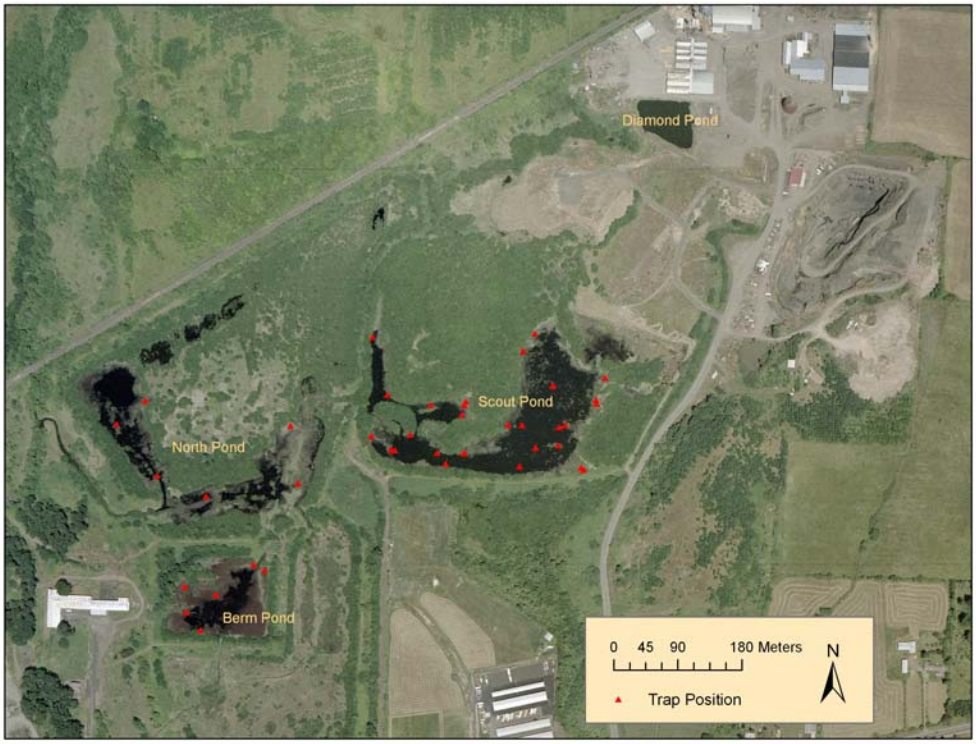

Figure 2. Locations of turtle trapping stations at Newton Creek wetlands. 2005 digital orthophoto quad courtesy of Benton County GIS.

For each individual captured, we recorded the following data: date of capture, trap location where captured, the unique identification number, sex, carapace length (mm), body mass (g), capture/recapture status, and the transmitter frequency (if applicable). We did not palpate females to determine if they were gravid because the capture period was too early in the breeding season for eggs to have developed sufficiently to become palpable.

Monitoring Turtle Movement & Nesting Activity

An important objective of the pilot study was to examine movement patterns and identify areas used for nesting by Northwestern pond turtles. This information would be useful to guide future habitat restoration projects and other conservation efforts being undertaken by the MPNRIC at Newton Creek wetlands. Oviposition sites we could locate were to be protected by wire predator exclosures.

We attempted to determine the location of every radio-tagged female at least once every day from May 30 to July 12, 2007 using radio telemetry receivers. We concentrated our daily search effort during late afternoons and early evening hours to correspond to the time of day when terrestrial movements and nesting activity are most frequent. When the direction of a radio signal from a tagged female indicated she was on land, we attempted to precisely locate her position without disturbing her activity. We generally approached turtles on land no closer than 10 m, unless we remained uncertain about her position after two hours. We marked confirmed locations with a plastic flag and recorded their geographic positions with a GPS receiver.

When possible, we used a wildlife detector dog to search for turtles on land, nests, and tracks left by turtles. This dog has been used to track Northwestern pond turtles and red-eared sliders to their nests since 2004. During the 2006 nesting season, this detector dog found 87% of test targets (i.e., live, captive turtles and simulated nests) placed during search missions (Vesely 2006).

Results and Discussion

Population Structure

We captured a total of 26 turtles, mostly adult males (Figure 3). Recapture rates were also higher for males than females, suggesting that males are more likely to be captured than females given our methods (Figure 3). It is uncertain whether the population structure actually is skewed towards males, or females are less prone to capture because of behavioral or physical attributes. Further research is necessary to determine the different detection probabilities between sexes and among age classes to allow proper inference on population structure. We did observe two very small juveniles (estimated carapace length <60mm) basking on logs in Scout Pond, providing evidence of some recruitment of young at the site.

The average carapace length of captured females was 172 mm (Figure 4) and their mean weight was 853 g (Figure 4). In the Willamette Valley, female Northwestern pond turtles probably are not mature enough to reproduce until they attain a length of 120-130 mm and are 10-12 years of age (Holland 1994). All of the females we captured were sufficiently large to be capable of breeding.

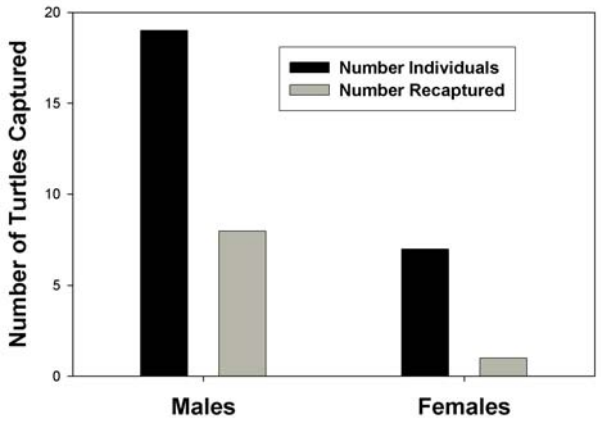

Figure 3. Numbers of captured and recaptured Northwestern pond turtles in 2007. Newton Creek wetland, Benton County, Oregon.

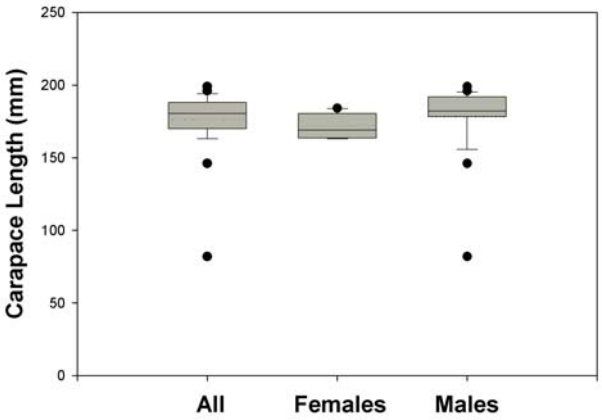

Figure 4. Mean and variance of Northwestern pond turtle carapace lengths. Newton Creek wetland, Benton County, Oregon.

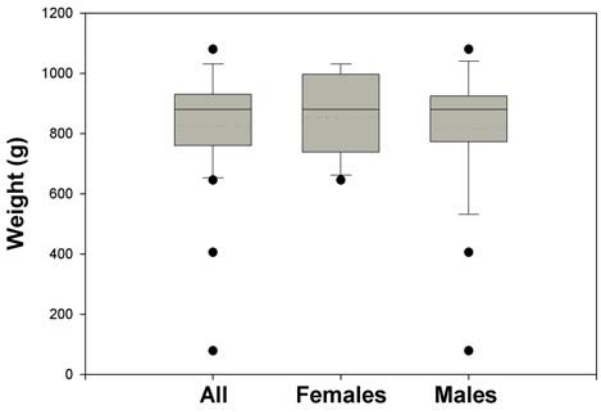

Figure 5. Mean and variance of Northwestern pond turtle weights. Newton Creek wetland, Benton County, Oregon.

Terrestrial Movement and Nesting Activity

Of the 26 turtles we captured, we attached a radio transmitter to six females and three males. We will estimate home ranges and describe movement patterns of all radio-tagged turtles in a later report. Here, we report on major movements of three females to demonstrate their use of multiple ponds and terrestrial landscape features.

Female 71 was first captured in Berm Pond in late May. During June and early July, she moved from the north end of Berm Pond to the southeast end of North Pond, to a channel west of North Pond, and then returned to the southeast end of the North Pond (Figure 6). We do not know the precise path taken by Female 71 between these positions, but all of these aquatic features were interconnected during our monitoring period and it would have been possible for her to accomplish these trips without leaving water.

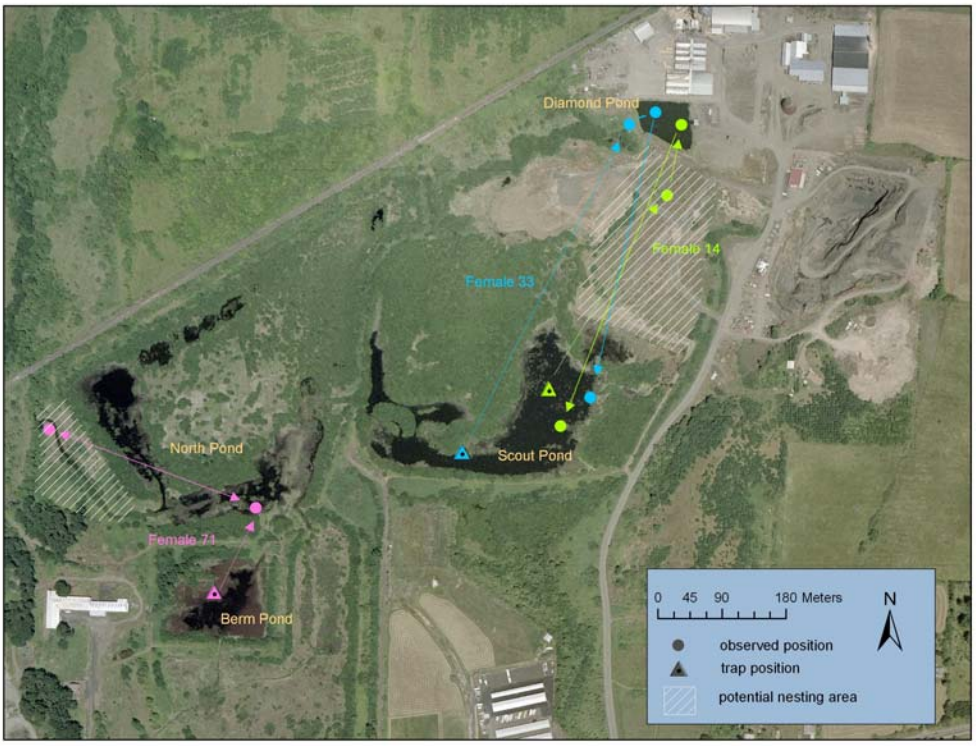

Figure 6. Selected movements of three female Northwestern pond turtles and potential nesting areas at Newton Creek wetlands. Arrows indicate the shortest distance between observed positions, not necessarily the path taken by the turtle.

Although our pilot study ended in July 2007, we attempted to relocate the radio-tagged turtles on December 4 and December 12, 2007 to identify over-wintering areas. Female 71 was the only turtle whose transmitter we were able to detect. On December 4, she was in a patch of shrubs approximately 150 m west of Berm Pond. The following week, she had moved into a grove of oaks approximately 50 m south from her former position and was burrowed underground. These observations are consistent with other reports of Northwestern pond turtles over-wintering on land in the Willamette Valley.

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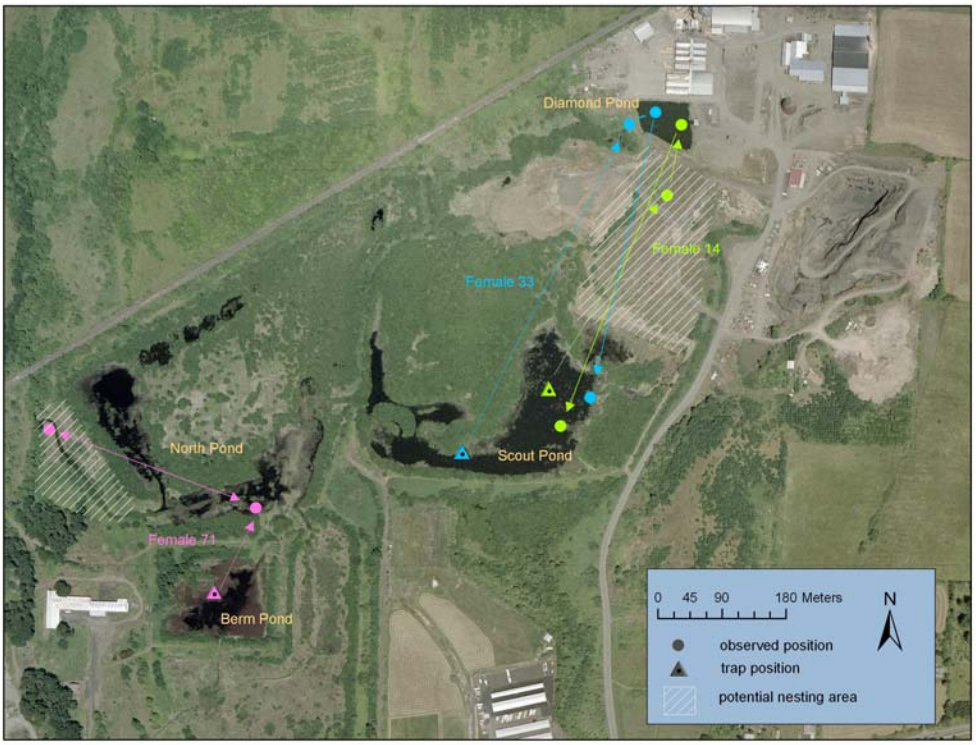

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Female 14 was originally trapped near the north edge of Scout Pond in May (Figure 6). She remained near that area until we relocated her on land on the evening of June 10. She was found in dense forbs, approximately 0.5 – 1.0 m tall. We then relocated her in

Diamond Pond, where she was regularly relocated for several days. She eventually returned to Scout Pond, where she remained until the end of the study. We are unable to determine whether Female 14 migrated between the ponds using a narrow closed-canopy wetland extending north from Scout Pond to within 100 m of Diamond Pond, or alternatively, crossed the large open field between the two ponds.

Female 33 was originally trapped near the south end of Scout Pond (Figure 6). During June, she moved to Diamond Pond, where she was observed once on land in that area. She eventually returned to Scout Pond, where she remained until the conclusion of the pilot study. area until we relocated her on land on the evening of June 10. She was found in dense forbs, approximately 0.5 – 1.0 m tall. We then relocated her in Diamond Pond, where she was regularly relocated for several days. She eventually returned to Scout Pond, where she remained until the end of the study. We are unable to determine whether Female 14 migrated between the ponds using a narrow closed-canopy wetland extending north from Scout Pond to within 100 m of Diamond Pond, or alternatively, crossed the large open field between the two ponds.

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From these three individuals, we identified two areas in which turtles were particularly active on land. One of these areas is a grassy opening west of North pond approximately 1 ha in size (Figure 6). Most of the area appears very suitable as nesting habitat for turtles. We discovered two sites in the vicinity of the channel where a turtle had excavated a nest chamber, but did not oviposit. On two occasions, the detector dog indicated turtle tracks that originated at the edge of the channel and wandered across the area. However, we found no further evidence of nesting activity in this opening.

A second area where female turtles made terrestrial movements was a 3 ha field between Scout and Diamond Ponds (Figure 6). Soils in this area appear to have been highly disturbed by excavation, mixed with off-site fill, and compacted. Tall, dense grass makes much of the area unsuitable as nesting habitat, but scattered openings in the vegetation do seem to offer some excellent nest sites. Given the timing of movements by Females 14 and 33, and the proximity of Diamond Pond to potential nesting sites, we believe it likely that these females were making staging movements towards nesting sites. However we did not find complete nests or uncompleted nest chambers during searches of this area.

Research and Management Recommendations

We initiated this pilot study to evaluate a method for locating nests using radio telemetry and detector dogs. We identified two areas in Newton Creek wetlands where there was strong evidence of nesting activity, although the lack of our finding nests suggests other areas may also provide nest habitat. Further, the lack of finding long-distance movements and our regular relocation of most radio-tagged turtles in the ponds, suggests nesting was

near ponds. Given the current understanding of western pond turtle biology and our findings, these two areas should be considered highly likely nesting areas for Northwest pond turtles. Landowners at Newton Creek wetlands could benefit turtles by maintaining suitable nesting habitat (i.e., no trees or shrubs, sparse ground cover vegetation) and minimizing human activity in these areas during the nesting season. Other areas in Newton Creek wetlands also seem suitable for nesting, such as the open field near the Boy Scout camping site and the grasslands south of Berm Pond. However, our pilot study does not allow us to determine if turtles currently use these areas.

There are a number of reasons why we may have failed to locate nests using telemetry receivers, visual searches, and detector dogs:

- Nesting may have occurred outside of our May 30-July 12 survey period.
- Nesting may have occurred during the survey period, but at times of day when the study site was not being monitored.
- Turtles were nesting very near shore and we mistakenly believed the radio signals were coming from the pond, so didn't do follow-up visual searches.
- The detector dog failed to find nests because of environmental factors or inadequate training.
- The presence of the investigators and detector dog caused female turtles to abandon most nesting activities.
- Most female turtles failed to nest in the area because of unknown causes, including a year when nesting may have been limited, as it may have been at other Willamette Valley sites (K. Beal, pers. commun.).

We established the timing of the pilot study to coincide with the season of most frequent nesting activity in the Willamette Valley reported by other investigators. However, nesting has been observed as early as mid-May and as late as August in the region. Furthermore, we were only able to monitor turtle activity at the site for approximately six hours per day because of the limited personnel provided for this pilot study. We cannot rule out the possibility that we failed to detect nesting activity because it was occurring outside of our monitoring period.

We were generally satisfied with the performance of the radio transmitters and telemetry system. Nevertheless, we experienced some difficulty determining precise locations of turtles and nests. Earthen dikes and other topographic features on the landscape interrupted radio signals and caused them to bounce. CB radio traffic emanating from the nearby gravel mining operation and lumber mill caused severe telemetry interference near Scout Pond. We also attempted to maintain a distance of at least 10 m from turtles we believed to be on land or near the edge of the pond, thus may have not located the turtles with enough precision to find nests during subsequent visual searches. Similarly, if nesting occurred near ponds, it would have been difficult to determine this with certainty because of imprecision of radio telemetry and the presumed short duration that turtles were on land for short-distance movements. We will continue to evaluate our telemetry methods and address problems that became apparent during the pilot study.

The detector dog did make important contributions in finding one of the turtles on land, a nest start, and indicating the path of some turtles during their terrestrial movements. However, we cannot determine how many nests the dog may have missed. The detector dog used in the pilot study has been trained since 2003 to find Northwestern pond turtles and red-eared sliders. Written records have been kept for every training session and search mission performed by the dog. According to these records, the dog has successfully detected 72% of targets (i.e., live turtles or artificial nests) during field tests conducted during 2005 and 2006. However, the reliability of the dog to find turtle nests has not been subjected to rigorous double-blind testing by independent observers. There are at least three factors that significantly limited the dog's capability to detect turtles and nests. First, odors used by detector dogs to find their targets dissipate faster on cloudless days and as air temperature rises. Records for the dog used in our pilot study indicate she can reliably find turtle tracks and artificial nests 12 hours after they were created under optimal conditions. However, her performance drops off significantly when temperatures exceed 25 C, which is common in the Willamette Valley during summer. Second, seeds from some species of grass and forbs that are common in turtle nesting habitats are a significant hazard for detector dogs. Seeds can be inhaled, fall into the dog's ears, and penetrate skin between the toes. By mid-July there were some areas in Newton Creek wetlands that were too hazardous for the dog to work because of the abundance of certain plants, so were visually searched without her aid. Finally, the detector dog's handler was also responsible for conducting much of the telemetry monitoring during evening hours and therefore had a limited amount of time to devote to searches with the dog. She was typically only used two or three times a week and she would have been unlikely to detect turtle nests created >8 hours before a search. It is possible that daily searches would have yielded more evidence of nesting activity. We are currently designing more objective tests to measure the reliability of detector dogs to find Northwestern pond turtles and other rare species of animals and plants. Such testing is necessary to use detector dogs with confidence in the future.

Perhaps the most important finding of our study from a management perspective is that we were able to determine that individual turtles at Newton Creek wetlands utilize large landscapes composed of different aquatic and terrestrial habitat types. Ponds, grasslands, and woodlands, all provide important life requisites for turtles during different seasons of the year. Ensuring the persistence of Northwestern turtles at Newton Creek wetlands will demand management strategies that encompass not only the ponds where turtles are typically observed, but surrounding terrestrial areas where turtles are seldom seen but nevertheless contain critical resources essential for their survival in this area.

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