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Natural Resources Conservation Service

CEAP Conservation Insight
Conservation Effects Assessment Project

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Farm Bill Conservation Programs Can Help Meet the Needs of Spring-Migrating Waterfowl in Southern Oregon-Northeastern California

Summary Findings
The Southern Oregon-Northeastern California (SONEC) region is an important migration and breeding area for Pacific Flyway waterfowl.

Through a Conservation Effects Assessment Project (CEAP) partnership, the Intermountain West Joint Venture conducted a preliminary analysis of the contribution of SONEC Wetlands Reserve Program (WRP) enrollments in meeting recently established spring migrating waterfowl habitat objectives.

Results suggest that WRP wetlands may meet up to 21 percent of the energetic needs for spring-migrating dabbling ducks in SONEC at North American Waterfowl Management Plan goal levels.

Observations
Spring-migrating waterfowl habitat conservation targets for SONEC on private lands call for 64,700 acres of flood-irrigated agricultural wetland habitat.

Recent trends in conversion from flood irrigation to sprinkler irrigation of pastures present challenges to meeting spring migrating waterfowl habitat objectives in SONEC.

Management Insights
Spring flooding and vegetation management that provides shallow water habitats and early-successional vegetation can greatly benefit pintails and other migrating waterfowl and shorebirds.

Working lands conservation programs can be used strategically to support flood irrigation on working ranches and help meet SONEC spring-migrating waterfowl habitat requirements.

Easement programs that restore and maintain wetland hydrology in the spring and allow haying and grazing as compatible uses and/or as regular vegetation management tools can help meet SONEC spring-migrating waterfowl habitat objectives.

Background

Wetland systems in Southern Oregon-Northeastern California (SONEC) have long been recognized for their importance to wetland birds. Up to 70 percent of the Pacific Flyway's migrating waterbirds have been reported to pass through just 2 of 11 SONEC subregions. The SONEC region contains eight Shorebird Key Sites identified by the Intermountain West Joint Venture (IWJV) that meet regional or national Western Hemispheric Shorebird Reserve Network criteria. The region also hosts continentally significant portions of several waterbird populations including Clark's grebes, sandhill cranes, and white-faced ibis.

The SONEC region lies in the west-central portion of the Great Basin Bird Conservation Region (BCR 9) and encompasses approximately 13 percent of the BCR surface area (fig. 1). SONEC is generally "basin and range" topography. It contains some watersheds connected to the Pacific Ocean and others that drain into terminal, closed basins. This expansive area contains a rich array of potential spring habitat for waterfowl and other waterbirds in the form of grasslands, pasture and hay lands, marsh, open water wetland, and croplands.

Water supplies are derived mainly from snowmelt, and wetlands experience wide fluctuations in hydrology that are directly related to annual variability in snowpack. The SONEC region also experiences some of the highest evapotranspiration rates in North America. As a result, the availability of wetland habitat can vary dramatically both within and among years. However, wetland densities in the SONEC region are high relative to densities in other parts of the Intermountain West. The SONEC region alone encompasses approximately 15 percent of inventoried wetland area in the entire Intermountain West, highlighting the significance of this region for Pacific Flyway waterbirds.

Significance of SONEC to Waterfowl

Historically, peak waterfowl abundance in SONEC likely occurred during fall and spring migration. The region serves as a critical linkage for Pacific Flyway waterfowl between northern breeding grounds and continentally important wintering areas in the Central Valley and San Francisco Bay regions of California. Although peak waterfowl populations occur during migration, SONEC is also regionally significant to Pacific Flyway breeding ducks. For example, up to 20 percent of the continental population of cinnamon teal and 18 percent of all Pacific Flyway mallards and redheads may breed in SONEC. Much of the conservation and management focus for water-

Figure 1. Extent of the SONEC region within the Great Basin Bird Conservation Region

fowl populations in SONEC over the past half-century has been on providing habitat during fall migration and the summer breeding periods.

Providing adequate fall migration and breeding habitat in SONEC remains a priority for waterfowl managers. However, research over the past decade has greatly improved our understanding of the region's significance to spring-migrating waterfowl. Region-wide aerial surveys detected a spring peak abundance of at least 2 million waterfowl (ducks, geese, swans and coots) in SONEC, with at least 128 million waterfowl use-days supported throughout 4-month spring migration season (Fleskes and Yee 2007).

Northern pintails (fig. 2) are particularly abundant and make up 25 percent of all waterfowl use-days and 47 percent of all dabbling duck use-days in SONEC during spring (Fleskes and Yee 2007). The northern pintail is a high priority species because the population remains below North American Waterfowl Management Plan goals (NAWMP 2004, 2012).

Nearly 30 percent of the continental population of northern pintails relies on wetland habitats in SONEC to meet spring migration food energy needs.

Other research has indicated that over 80 percent of northern pintails wintering in the Central Valley of California use the SONEC region during spring migration (Miller et al. 2005). The Central Valley of California is a primary wintering area for northern pintails and other waterfowl in North America. Nearly 30 percent of the continental population of northern pintails relies on wetland habitats in SONEC to meet their food energy needs during spring migration on their way to primary breeding areas in Alaska and the U.S. and Canadian prairies (Fleskes and Yee 2007).

The ability to acquire adequate energy stores on spring staging areas can directly influence the breeding performance of waterfowl, especially for early nesting species such as northern pintail. Inadequate habitat and food supplies in spring migration areas such as SONEC could result in lower survival probability; later nest initiation; and reduced clutch size, nest attentiveness, and/or brood survival (Devries et al. 2008, Yerkes et al. 2008). Therefore, providing adequate habitat supplies for northern pintails and other waterfowl in the SONEC region has important implications for sustaining continental populations.

Figure 2. Northern pintails in a flooded pasture in the SONEC region

PHOTO: MIKE SHANNON

Developing Conservation Targets

Because of the continental significance of SONEC to northern pintail and other waterfowl populations, conservation partners have identified the need to develop habitat objectives linked to population needs and limiting factors. During migration, a key population limiting factor is the availability of habitats that provide food resources to fuel migration and provide energy reserves for reproduction.

Accordingly, U.S. Geological Survey Western Ecological Research Center (USGS) along with other conservation partners developed a series of research projects to better understand the ecology of waterfowl and their habitats during spring migration in SONEC. These studies sought to evaluate the temporal and spatial distribution of waterfowl through spring, estimate habitat availability, evaluate habitat use and food habits, and estimate food availability in key habitats (Fleskes and Battaglia 2004). These studies showed that more than 40 percent of overall northern pintail use in SONEC occurs on private lands. This estimate increases to 70 percent when the Lower Klamath Basin is excluded (few private wetlands occur in the Lower Klamath Basin and most waterfowl use occurs there on national wildlife refuges). On these private lands, seasonally flooded hay and pasture lands (i.e., flood-irrigated habitats) are important spring-foraging habitats for northern pintails, making up 25 percent of use overall and 50 to 75 percent of use in five subregions.

Much of SONEC's spring flooded wetland habitat is currently used for hay production and grazing. Flood-irrigated habitats are typically managed through summer haying and/or fall and winter

grazing followed by spring flooding. These habitats occur mostly on altered seasonal wetlands that were historically flooded from snowmelt.

The Chewaucan Marsh provides a typical example. The Chewaucan River drains into the Upper and Lower Chewaucan Marshes before terminating in Lake Abert, the largest saline lake in the Pacific Northwest. Historically, the Chewaucan Marsh totaled about 30,000 acres of emergent marsh—significant habitat for spring-migrating waterfowl in years of high runoff. Today the former Chewaucan Marsh is devoted to forage production for cattle and is grazed and hayed annually. However, every spring landowners divert water across much of the marsh to increase soil moisture. Throughout SONEC, private landowners have developed the infrastructure needed to deliver water over large areas of hayed and grazed lands, with great potential to benefit spring-migrating water birds.

The IWJV used bioenergetic models to develop habitat objectives that meet the food energy needs of migrating dabbling ducks in SONEC. These bioenergetic models quantify population and habitat relationships by relating waterfowl population energy demands to the supply of food energy in foraging habitats (e.g., flood-irrigated habitats) within a given landscape. The first step in this process was to identify population objectives for SONEC linked to NAWMP objectives. Population objectives were determined for six of the most abundant dabbling duck species in SONEC during spring reported by Fleskes and Yee (2007). This process identified a population objective of 4.87 million spring-migrating dabbling ducks in SONEC equating to 104.7 million dabbling duck use-days (table 1).

Privately owned hay and pasture lands in SONEC that are flood irrigated provide important seasonal habitats for spring migrating waterbirds.

Population objectives were established for seven of 11 SONEC subregions based on estimates of the spatial distribution of dabbling ducks reported by Fleskes and Yee (2007): Upper Klamath, Summer Lake, Warner Valley, Malheur, Lower Klamath, Modoc Plateau and Northeast California (fig. 3). Estimates of spring waterfowl abundance were unavailable for the remaining four subregions, but relative use is expected to be lower based on studies tracking migration patterns of marked northern pintails (Miller et al. 2005, Fleskes and Yee 2007). Standardized estimates of waterfowl energetic requirements (Miller and Eadie 2006) were then applied to subregion population objectives to derive estimates of population energy demand.

Estimates of waterfowl food densities in flood-irrigated habitats obtained from sampling efforts by USGS were used to calculate the amount of flood-irrigated habitat required to meet population energy demands in each subregion (J.P. Fleskes, USGS, unpublished data). Dabbling ducks are unlikely to meet all of their foraging needs on private flood-irrigated habitats alone. An estimated 25 percent of the total dabbling duck food energy needs outside of the Lower Klamath subregion during spring are assumed to be met by publicly managed habitats in SONEC. Therefore, flood-irrigated habitat objectives assume that 75 percent of dabbling duck food energy needs should be met by flood-irrigated habitats in the remaining subregions (the maximum estimate of the contribution of private lands within these subregions from Fleskes and Battaglia [2004]). These habitat objectives were compared to estimates of existing flood-irrigated habitats in each subregion as reported by Fleskes and Gregory (2010). Overall, this process yielded an objective of 64,700 acres of flood-irrigated habitats required to meet the population energy demands of dabbling ducks at NAWMP goal levels during spring migration in SONEC (table 2).

Some subregions currently have enough flood irrigated lands to meet habitat objectives while others do not. Conservation strategies should focus on maintaining current habitats in subregions with adequate acreages and expanding flood

Figure 3. Subregions of SONEC from Fleskes and Yee (2007). Subregions contain wetland complexes/basins.

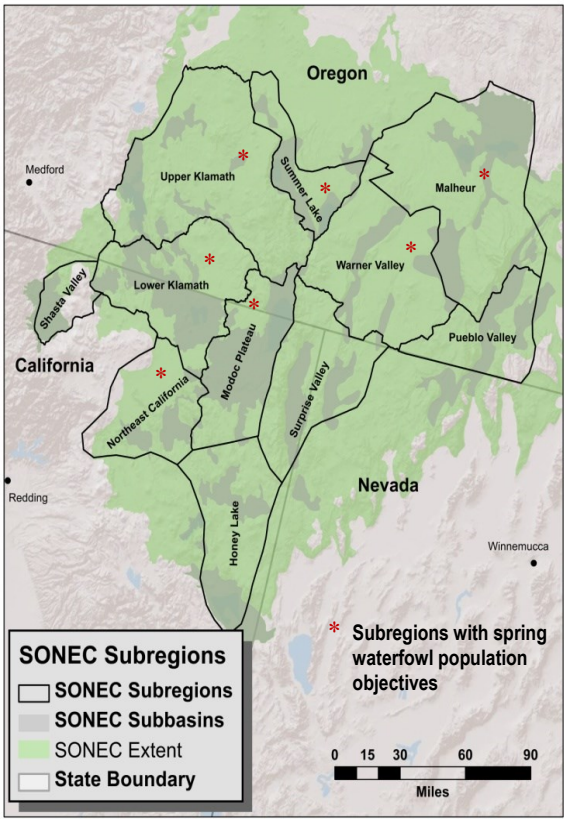

Table 1. Population objectives linked to North American Waterfowl Management Plan goals for six principal dabbling duck species during spring migration in SONEC.

Species	Spring Population Objective
Northern pintail	2,418,000
American wigeon	1,140,000
Northern shoveler	613,000
Green-winged teal	520,000
Gadwall	111,000
Mallard	66,000
Total	**4,868,000**

irrigated habitats where needed to meet subregion objectives. Conservation measures can be implemented in ways that retain or mimic land/habitat management practices that provide foraging benefits equivalent to current private flood-irrigated and haying/grazing management. Historically, natural flooding in these snowmelt-driven systems resulted in a complex of wetland types where shallow lakes and seasonal palustrine wetlands likely provided significant food resources to spring migrating waterfowl. Today, some wetland plant communities contain non-native, seed-producing plants (e.g., reed canarygrass) but native wetland plants are still an important component of these flood-irrigated wet meadow systems and provide important spring waterfowl foods (J. P. Fleskes, USGS, unpublished data).

The timing of spring flooding for irrigation varies depending on a variety of factors including watershed characteristics (e.g., elevation), water rights/availability, and land management objectives of producers. Spring flooding generally mimics the natural flooding that occurred in these systems—optimal waterfowl foraging habitat potential occurs where flooded vegetation is in early succession. Annual haying and grazing sustains shallow, open-water wetland habitat suitable to spring migrating waterfowl and shorebirds.

Water Use and Flood Irrigation

Increasing competition for water supplies, aging infrastructure, changes in land values and agricultural economics, and other factors make flood-irrigated private lands susceptible to changes in ownership and/or management that could negatively impact their value as spring waterfowl habitats. Flood irrigation is increasingly being challenged because of the relatively large quantities of water required.

In SONEC, and particularly in the Klamath Basin where irrigation water use can impact federally-listed threatened or endangered fishes, improving irrigation efficiency on agricultural lands is a high priority. Working lands conservation programs such as the Environmental Quality Incentives Program (EQIP) have been used extensively to convert traditional flood irrigation to more efficient sprinkler systems. From 2002 to 2007, NRCS invested over $50 million in EQIP financial assistance just in the Klamath Basin to help producers improve irrigation efficiency and generate water savings to reduce demands on limited stream flow and benefit at-risk fishes.

Despite the clear benefits of water conservation, a consequence of converting flood irrigation to sprinkler systems is the loss of seasonally-flooded lands that previously provided important habitat for migrating waterfowl and other wetland wildlife. The trend toward increasing use of sprinkler irrigation and reduction in flood-irrigation practices (Kenny et. al. 2009) is associated with the loss of foraging habitat for a wide range of wetland birds. Since water conservation efforts will continue to be needed as demand for water resources grows, it will be increasingly important to strategically focus irrigation efficiency improvements where most needed and maintain flood-irrigated lands where it makes sense to avoid reducing one resource concern while creating another.

Wildlife and water use efficiency objectives can both be met by spatially targeting the right practices in the right places. For example, water conservation efforts can be focused on sites where water does not pond readily, such as coarse-textured (e.g., sandy) soils or sloped lands, whereas efforts to maintain flood irrigation systems for habitat benefits could be targeted on flatter sites where soil texture is conducive to holding surface water and in drainages where flood irrigation does not jeopardize at-risk fish species.

Subregions in the eastern portion of SONEC, particularly in Warner Valley where existing habitat is below target acreage (fig. 3, table 2), may provide the best opportunity to focus assistance to landowners to sustain flood irrigation systems needed to support wetland wildlife habitat requirements. Streams in these subregions typically drain into closed basins and do not contribute to downstream flows accessible to at-risk species like salmon. Providing NRCS technical and financial assistance to improve and maintain flood irrigation in these areas can help meet NAWMP goals for SONEC spring waterfowl migration habitat and strengthen the working lands model for wildlife conservation.

Table 2. The amount of flood-irrigated habitat assumed to currently exist based on estimates from Fleskes and Gregory (2010) and the amount required to meet 75 percent of dabbling duck needs (acres) within seven SONEC subregions. Dabbling duck needs not met by this habitat are assumed to be met by public lands.

SONEC subregion	Existing habitat (acres)	Habitat required to meet 75 percent of dabbling duck needs (acres)
Modoc Plateau	13,000	13,500
Malheur	15,300	5,300
NE California	13,500	9,800
Upper Klamath	18,800	17,300
Summer Lake	4,100	8,300
Warner Valley	7,500	10,500
Lower Klamath	7,100	Not Determined
Total [a]	**79,300**	**64,700**

[a] These estimates exclude that portion of the SONEC dabbling duck population that relies on the Lower Klamath Subregion.

Evaluating WRP to Meet Spring Waterfowl Energetic Needs

Perpetual conservation easements have been used effectively in other North American landscapes important to waterfowl and other wetland wildlife (e.g., Prairie Pothole Region, Mississippi Alluvial Valley, Central Valley of California). Likewise, wetland easements can play an important role in addressing the needs of waterfowl in SONEC. Conservation easements that embrace spring seasonal flooding can be used to secure the SONEC spring waterfowl migration habitat base for the future. Ranchers

who rely on one summer hay cutting as a foundation of their livestock operations have understandably been unwilling to sell their haying rights, which has prevented some from enrolling in the Wetlands Reserve Program (WRP). However, WRP easements that allow haying as a compatible use under approved conservation plans can still play an important role in meeting SONEC waterfowl habitat objectives.

Landowners have worked with the Natural Resources Conservation Service (NRCS) to establish over 54,000 acres of WRP easements in SONEC (fig. 4). These easements contain a variety of wetland and upland habitat types. Current estimates suggest that over 24,000 acres of these WRP easements are palustrine emergent wetlands as categorized by National Wetlands Inventory data. However, the degree to which existing WRP wetlands in SONEC contribute to meeting the needs of spring migrating waterfowl is unknown. In an attempt to gain insight, researchers from USGS sampled three WRP wetlands while evaluating duck food densities in flood-irrigated habitats within SONEC. While estimates of duck food densities in managed and unmanaged foraging habitats are robust in certain parts of North America (e.g., Mississippi Alluvial Valley), such estimates are sparse in western North America, especially in the Intermountain West. These few WRP samples from SONEC in spring yielded a seed biomass estimate (323 lbs/acre; J.P. Fleskes, USGS, unpublished data) intermediate to the range of recent estimates from WRP wetlands in Oregon outside of SONEC during fall (168–500 lbs/acre; Evans-Peters et al. 2012). A simple bioenergetic equation was then used to calculate potential duck-energy-days (DED) in existing SONEC WRP easements (fig.5).

The result suggests that existing WRP wetlands have the potential to meet up to 21 percent of the energetic needs of spring migrating dabbling ducks in SONEC at population objective levels. However, it is unknown how representative these few WRP sample wetlands are of WRP throughout the SONEC region. Given the broad extent and diversity of wetland habitats and management objectives in SONEC, it is likely that only a subset of the WRP easements provide the habitat conditions favored by spring-migrating waterfowl in any given year. Consequently, more comprehensive evaluations of WRP in SONEC are required to more fully understand the role of WRP in meeting the needs of migrating waterfowl. Specifically, more WRP habitats need to be sampled in the SONEC region to obtain more reliable estimates of waterfowl food types and densities.

WRP wetlands in SONEC undoubtedly provide important habitat to waterfowl during other annual cycle events (e.g., breeding) and to a variety of other avian populations (e.g., rails), wetland-dependent wildlife (e.g., amphibians), and other priority species which may have different habitat requirements than those of migrating dabbling ducks. Developing wetland conservation objectives for other avian populations is a logical next step in SONEC conservation planning. Likewise, further evaluations of WRP functions and values are needed to assist NRCS in the adaptive management of this critical program in one of North America's most important landscapes for wetland-dependent migratory birds.

Preliminary sampling indicates that current WRP habitats may provide up to 21 percent of SONEC spring migrating duck energy needs.

Management Recommendations

Flooding to provide shallow-water habitat throughout the SONEC waterfowl and shorebird migration period is needed. This can be accomplished through staggered flooding and drawdowns in large wetland complexes such as Chewaucan Marsh. Flooding schedules for suitable WRP enrollments in smaller wetland complexes should be established in concert with the waterfowl spring migration chronology to ensure habitat is provided to meet energetic demands.

Additional information is needed regarding the timing and extent of flooding on private lands throughout SONEC to further inform WRP management. However, these hydrology and wetland man-

Figure 4. Extent of Wetland Reserve Program easements in the SONEC region.

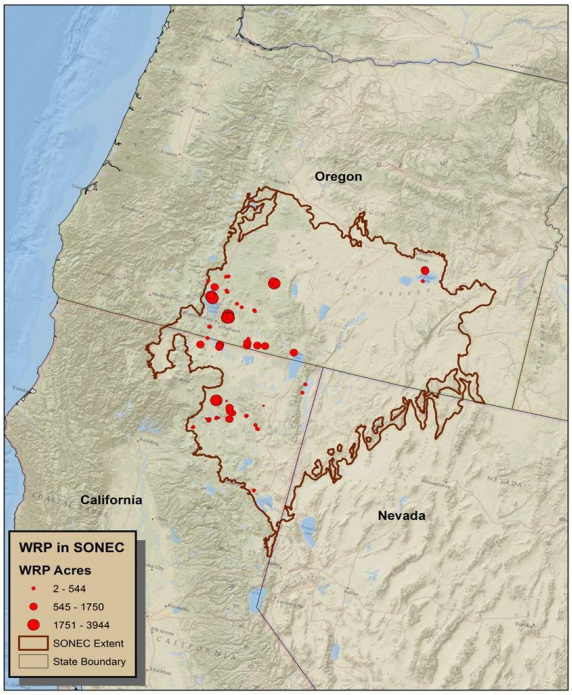

Figure 5. Bioenergetic equation used to calculate potential duck-energy-days in existing SONEC WRP easements.

$$\frac{\text{Acres of WRP} \times \text{WRP seed biomass} \times \text{True Metabolizable Energy (kJ/g) of seeds}}{\text{Energy demand of 1 duck/day}}$$

$$\frac{(24{,}110 \text{ acres}) \times (293^{*} \text{ lbs./acre}) \times (10.5 \text{ kJ/g})}{1{,}536 \text{ kJ/day}}$$

21,893,758 duck-energy-days

*Accounts for foraging giving-up-density adjustment of 30 lbs. acre (Naylor 2002; 323–30 = 293)

agement recommendations are in line with current flood-irrigation and vegetation management practices (i.e., grazing/haying) so should support the economics of ranching operations and contribute to the conservation of Pacific Flyway waterfowl populations.

Vegetation management that promotes early successional conditions with seed and invertebrate food resources for waterfowl (and other wetland birds) is recommended. This can be accomplished through annual haying and grazing, conducted outside the primary bird nesting season, that maintains shallow, open-water wetland habitats suitable to spring migrating waterfowl and shorebirds. Farm Bill conservation easement programs focused on working lands, such as the Farm and Ranch Lands Protection Program and Grassland Reserve Program, can be used to help maintain productive ranchlands that include haying and grazing and flood irrigation while providing valuable habitats for waterbirds and other wetland wildlife in the SONEC region.

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The Conservation Effects Assessment Project: Translating Science into Practice

The Conservation Effects Assessment Project (CEAP) is a multi-agency effort to build the science base for conservation. Project findings help to guide USDA conservation policy and program development and help farmers and ranchers make informed conservation choices.

One of CEAP's objectives is to quantify the environmental benefits of conservation practices for reporting at the national and regional levels. Because fish and wildlife are affected by conservation actions taken on a variety of landscapes, the wildlife national assessment draws on and complements the national assessments for cropland, wetlands, and grazing lands. The wildlife national assessment works through numerous partnerships to support relevant studies and focuses on regional scientific priorities.

This assessment was conducted through a partnership among NRCS, the Intermountain West Joint Venture, American Bird Conservancy, U.S. Geological Survey, and Ducks Unlimited. Primary investigators on this project were Josh L. Vest and W. Dave Smith (IWJV), Dan Casey (ABC), Joseph P. Fleskes (USGS), and Mark J. Petrie (DU).

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