Lake Mason Trip Report - 31 August 1998

In attendance: Mike Getman - Refuge Operations Specialist
Rick Sojda - Biological Resources Division
Charlie Pelizza - Fish and Wildlife Service
Leigh Fredrickson - Gaylord Memorial Laboratory
Murray Laubhan - Biological Resources Division

General

Lake Mason National Wildlife Refuge (NWR), located about 150 miles south of the prairie pothole region in central Montana, was established in 1941 for the purpose of providing breeding and migration habitat for migratory birds. Located 85 miles from headquarters (Charles M. Russell NWR), the refuge includes a wetland complex composed of numerous basins that exhibit hydroperiods ranging from temporary to semipermanent surface water. The largest wetland basins are Lake Mason, Talbot Lake, and Thom Lake. Of these basins, Lake Mason is the largest (1,250 acres; average storage volume is 3807 acre-feet; average depth is 2.13 feet), exhibits the longest hydroperiod, and has the greatest flood frequency. Soils of these basins are predominately clays and the growing season is about 118 days.

Current and historical records of avian use indicate that numerous waterbird guilds use the wetland complex. Over 150 species have been observed on the refuge, including 50 species of shorebirds and wading birds. Bald eagles and peregrine falcon are know to utilize the area. Waterfowl and shorebirds use refuge wetlands during migration and some waterfowl production also occurs. Peak waterfowl migration occurs in April (spring) and October (fall), with peaks of 35,000 birds recorded in the 1940's. Peak shorebird migration occurs during May (spring) and August (fall), with peaks of 15,000 recorded. Information on waterfowl production is based on indicated pair counts conducted during the past 9-year period. Twelve species of ducks and Canada geese are known nesters. In general, recruitment is estimated by assuming 50% of indicated pairs nest successfully, and assuming an average brood size of 5-6 ducklings. Using this method, the average of 900 indicated pairs results in an average annual recruitment of 2,230 (range = 0-5,768).

Hydrology

The historic hydrology of wetlands composing the complex is largely unknown due to physical modifications occurring within the watershed. During the 1930's, an attempt was made to increase the size and volume of water within Lake Mason by constructing (1) a water diversion structure (fixed crest structure) on Willow Creek, (2) a 1.5-mile canal between Willow Creek and Lake Mason, and an earthen dam was constructed downstream of Lake Mason.

However, since construction was completed (1937), water has only flowed out of Lake Mason via the structure twice in 61 years. Thus, the ability of these developments to influence water levels in Lake Mason occur at a very low frequency and provide no reliable management capability. Currently, water enters Lake Mason from Willow Creek at the northeast corner and accumulates behind a low ridge in the eastern section of the basin. Flooding of the basin occurs sometime between December and May. If sufficient water accumulates behind the ridge, water then enters the western, and lowest, portion of the basin. Outlet flow only occurs when the entire basin is full and proceeds down Willow Creek from the east corner of the wetland. Consequently, drying of the wetland usually occurs through evaporation.

Currently, the annual hydrology of Lake Mason is determined by two primary factors: (1) the extent of soil moisture prior to snowmelt, and (2) amount and timing of snowmelt runoff within the watershed (about 180 square miles). The average annual precipitation and evaporation is 1.04 feet and 3.8 feet; thus, wetlands on the refuge exhibit a negative precipitation/evaporation ratio. Perhaps of greater importance is the fact that June and July are the months of greatest precipitation, but during the period June-August the evaporation rate is 1.8 feet. This illustrates the importance of spring snowmelt to recharge these wetland basins. However, severe summer thunderstorms, which occur infrequently, also influence hydrology. For example, during July of 1997, a 4-inch precipitation event resulted in shallow flooding of Lake Mason. Based on conversations with Mike Getman, this precipitation event also has affected the amount of water in the basin during 1998.

Adjudication of water rights was completed in 1994. Although refuge rights are reasonably good, Willow Creek flows are not adequate to fulfil Service water rights to fill Lake Mason on an annual basis. During the past 15 the years, the following seasonal surface water conditions have occurred: (1) water present during spring but lake was dry by mid summer in 6 years, (2) water present year long in 5 years, (3) water present during fall only in 2 years, and (4) lake dry year long in 2 years. Widely fluctuating volumes of water in Lake Mason annually from 1993-1995 (range = 342-1,263 acre-feet) is further evidence of variable hydroperiods. Additionally, recent changes in land ownership within the watershed may negatively affect refuge water availability. Refuge water rights are not senior to those of Sinclair Oil, who recently purchased Pronghorn Ranch in 1994-95. Pronghorn Ranch, located along Willow Creek, is managed as a livestock operation. Alfalfa is also grown as a forage crop. The ranch has no water storage facility nor storage right, but water is pumped directly from Willow Creek during the period April-October to produce alfalfa and meet livestock demands. The ranch has constructed check dams in the creek to elevate water levels and facilitate pumping operations. Sinclair Oil is anticipating using their entire water right, which previous landowners did not.

Assessment of Current Conditions

The following assessment is based on a single site visit on 31 August 1998, information provided in a draft environmental assessment, and conversations with Mike Getman. However, because wetlands are dynamic systems, our inspection of the wetlands on the refuge must be considered in the larger context of potential variability in conditions on an annual basis.

Lake Mason NWR appears to be a good example of a functioning wetland complex because wetlands exhibit limited physical modifications and natural wetland processes are largely intact. Although Lake Talbot and Lake Thom were also inspected, we spent the majority of time on Lake Mason. Mason Lake is a shallow, horseshoe-shaped depressional wetland with widely varying abiotic conditions. The east section is topographically higher, but receives water first. Within this section there are several distinct zones. The lowest elevations contained unconsolidated sediments to depths of 12 inches and still had surface water (7 ppt). Water quality was turbid in the south portion of the pools, but was clear along the windward edge. The plant community was dominated by parrot feather and sago pondweed. Invertebrates were abundant and included the following: insects (midges, backswimmers, dragonflies/damselflies, and predaceous diving beetles), snails (physids, planorbids, lemneids), and crustaceans (sideswimmers). These pools received use by molting ducks, and fall staging ducks and geese. The open water pools are surrounded by a zone of hardstem bulrush. At the open water-bulrush interface, new bulrush shoots were abundant and ranged in height from below the existing water column to several feet above the water surface. As elevations increase, the monoculture of bulrush is replaced by a zone of hardstem bulrush clumps interspersed with foxtail barley, chenopods, saltgrass, clumps of alkali bulrush, and a thin, discontinuous algal mat. Seed production by plants in this zone was extensive. In 1998, this zone was flooded to depths of 1-2 feet, started to dry in early July, but was still saturated the first week of August. Within this zone, snail shells were abundant on the surface. Clumps of hardstem in this zone had new shoot development, but few stems extended above the soil surface. In addition, numerous stems in each clump appeared to be senesced indicating that large changes in the distribution robust emergents has not occurred. This is supported by aerial photography. There is minimal topographic separation between the bulrush and other plants in this zone indicating hydrology is a more important factor than elevation in determining the distribution of plant species. Soil salinities in this zone were 20 ppt. At slightly higher elevations, foxtail barley dominates the plant community.

The west section of the basin is distinct from the east section. The lower, west section, is separated by a low, distinct ridge. The plant zonation is distinctly different in the west section of the basin. At the lowest elevations, salinity of the water was 40 ppt and no emergent plants were present. However, algal mats and patches of foxtail barley seedheads were apparent throughout this unvegetated zone. Although the water column was not sampled to determine invertebrate composition, abundant flies, spiders, and crickets were observed on the soil surface. In addition, a portion of the unvegetated zone contained some surface water that attracted a large number of shorebirds (godwits, avocets, yellowlegs) at the time of inspection. Newly germinated chenopods were abundant at the upper edge of the unvegetated zone. As elevations increase, a concentric band of mature foxtail barley that produced an abundant seed crop replaces the chenopods.

<u>Summary</u>

Using the above information, in combination written documents provided for Lake Mason and previous experience with wetlands in arid environments, we think Lake Mason is unique because a diversity of habitat types, ranging from robust emergent vegetation for overwater nesting to ideal foraging habitat for shorebirds, are provided within a single basin. Further, these conditions occur naturally without the need for management actions. Although the basin has the potential to provide resources necessary for many avian species and many life cycle requirements (e.g., pre-breeding, nesting, brood rearing, molt), the natural hydrologic dynamics of the system that maintain productivity precludes providing these resources consistently within and among years.

Therefore, any attempt to significantly alter the hydrology of the basin may adversely effect the ability to provide resources in subsequent years.

If the annual hydroperiod in the east section is lengthened to provide resources for the full range of species and their associated life-cycle requirements, the following questions should be addressed:

(1) What is the potential for bulrush to expand into adjacent zones?
(2) Would an increase in bulrush reduce the area of seed production by other plant species currently in the basin?
(3) If bulrush expands to the extent that (1) and (2) do occur, does the ability for plant control exist? (a) design features (b) refuge staff time, (c) equipment, (d) hydrologic control
(3) Would salinities change and impact the potential for germination from seed? If so, does a loss of seed production impact any life requisites of target species?
(4) Would the amount of suitable habitat available for shorebirds be reduced or eliminated?
(5) Would the same number of pre-breeding ducks be attracted to a smaller area of deeply flooded habitat as compared to a larger, shallowly flooded area?

Memorandum

Date: September 14, 1998

To: Mike Getman, ROS, Lake Mason NWR

From: Charles Pelizza, SD Refuges Biologist

Subject: Lake Mason Trip Report and Per

Mike,

Attached, you will find the final trip report from Murray, Leigh and Myself. Please disregard any previous draft copies that you have received and use this report for future reference. In addition to the trip report, I would like to offer some personal observations related to internal FWS policy and guidance that I utilize during my internal check list when reviewing projects and visiting sites. While these thoughts are relevant to the site visit, they are not necessarily a component of the trip report. None the less, I feel strongly that these points require consideration when deciding upon a management activity, thus are included here.

The Fish and Wildlife Service has a long history of mandates and management activity related to migratory birds. Many of our earliest refuges were established for the protection of breeding and wintering migratory birds, specifically wading birds. Shortly after the inception of the "refuge system", a funding source presented itself (duck stamp sales via the Migratory Bird Hunting and Conservation Stamp Act), as did a continent-wide drought and concern for waterfowl. It is here that we first see a shift in management focus toward breeding waterfowl that exists to this day.

Recently, the Service, as well as the public in general has reemphasized our historic perspective in looking at our mandates for breeding, migration and wintering areas for migratory birds. Biodiversity, and ecosystem management may be current buzz words, but refuges are truly mandated to carry out these philosophies. Nowhere else is this better illustrated than at Lake Mason. Peak numbers of shorebirds indicate that overall numbers of shorebirds would rank Lake Mason as a WHSRN (Western Hemisphere Shorebird Reserve Network) Site of Regional Importance. Few sites on the continent can lay claim to be host to such an important migration stopover. Peak numbers of waterfowl occur during migration. The benefits those birds derive from foraging on seeds and invertebrates on their way to other breeding sites can not be dismissed, and most likely leaves them in better breeding condition than they would otherwise. Breeding waterfowl also occur at Lake Mason, with recruitment occasionally in large numbers.

The wildlife survey data currently collected indicates that Lake Mason is a biologically diverse habitat that provides migration and breeding habitat for multiple migratory bird species. These characteristics fall directly in line with current (and historic) philosophies, mandates and guidance. Based upon the site visit, one can see that the attractiveness of this area lies in the diverse and dynamic nature of the wetland complex. The key components of maintaining abiotic process upon which the vegetative communities rely are in place and functioning naturally.

Although in principal, it appears beneficial to gain management control of Lake Mason, one key question needs to be answered. "Can we, through our proposed project, improve upon the dynamic system that is currently in place, thus maintaining the benefits to these multiple species during multiple life cycle requirements, that guidance, mandates and management concerns are directing us to accomplish?" Given the constraints identified (water delivery and exit), potential concerns (robust emergents, loss of habitat diversity) and proximity to management resources (85 miles from office), as well as numerous unanswered questions specific to project design, it appears questionable that this project will provide not only the stated goal of providing more sustained breeding waterfowl recruitment, but may also negatively impact this functional and diverse community.

Sincerely,

/s/ Charlie Pelizza

Charles Pelizza
SD Refuges Biologist

cc Wright, Maury
King, Wayne
Hedrick, Mike
Fredrickson, Leigh
Laubhan, Murray

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Current and historical records of avian use indicate that numerous waterbird guilds use the wetland complex. Over 150 species have been observed on the refuge, including 50 species of shorebirds and wading birds. Bald eagles and peregrine falcon are know to utilize the area. Waterfowl and shorebirds use refuge wetlands during migration and some waterfowl production also occurs. Peak waterfowl migration occurs in April (spring) and October (fall), with peaks of 35,000 birds recorded in the 1940's. Peak shorebird migration occurs during May (spring) and August (fall), with peaks of 15,000 recorded. Information on waterfowl production is based on indicated pair counts conducted during the past 9-year period. Twelve species of ducks and Canada geese are known nesters. In general, recruitment is estimated by assuming 50% of indicated pairs nest successfully, and assuming an average brood size of 5-6 ducklings. Using this method, the average of 900 indicated pairs results in an average annual recruitment of 2,230 (range = 0-5,768).

Hydrology

The historic hydrology of wetlands composing the complex is largely unknown due to physical modifications occurring within the watershed. During the 1930's, an attempt was made to increase the size and volume of water within Lake Mason by constructing a water diversion structure (fixed crest structure) on Willow Creek, and a 1.5-mile canal between Willow Creek and Lake Mason. An earthen dam was also constructed downstream of Lake Mason.

However, since the downstream dam construction was completed (1937), water has only flowed out of Lake Mason via the structure twice in 61 years. Thus, the ability of these developments to influence water levels in Lake Mason occur at a very low frequency and provide no reliable management capability. Currently, water enters Lake Mason from Willow Creek at the northeast corner and accumulates behind a low ridge in the eastern section of the basin. Flooding of the basin occurs sometime between December and May. If sufficient water accumulates behind the ridge, water then enters the western, and lowest, portion of the basin. Outlet flow only occurs when the entire basin is full and proceeds down Willow Creek from the east corner of the wetland. Consequently, with the exception of these flood events, all drying of the wetland occurs through evaporation.

Currently, the annual hydrology of Lake Mason is determined by two primary factors: (1) the extent of soil moisture prior to snowmelt, and (2) amount and timing of snowmelt runoff within the watershed (about 180 square miles). The average annual precipitation and evaporation is 1.04 feet and 3.8 feet, respectively; thus, wetlands on the refuge exhibit a negative precipitation/evaporation ratio. Perhaps of greater importance is the fact that June and July are the months of greatest precipitation, but during the period June-August the evaporation rate is 1.8 feet. This illustrates the importance of spring snowmelt to recharge wetland basins. However, severe summer thunderstorms, which occur infrequently, also influence hydrology. For example, during July of 1997, a 4-inch precipitation event resulted in shallow flooding of Lake Mason. Based on conversations with Mike Getman, this precipitation event also has affected the amount of water in the basin during 1998.

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Lake Mason is a shallow, horseshoe-shaped depressional wetland with widely varying abiotic conditions. We think Lake Mason is unique because a diversity of habitat types are provided within a single basin. The east section is topographically higher than the west section and is separated by a natural low level berm. The east section receives water from Willow Creek first, and also discharges water to Willow Creek when the entire basin is full. Within this east section there are several distinct zones. The lowest elevations contained open water with unconsolidated sediments to depths of 12 inches. During the wettest years, these areas are flooded to depths of 4-5 feet. During our visit, these areas still had surface water (7 ppt salinity), but were flooded to depths less than 3 feet. Water quality was turbid in the south portion of the pools, but was clear along the windward edge. The plant community was dominated by parrot feather and sago pondweed. Invertebrates were abundant and included the following: insects (midges, backswimmers, dragonflies/damselflies, and predaceous diving beetles), snails (physids, planorbids, lemneids), and crustaceans (sideswimmers). These pools received use by molting ducks, and fall staging ducks and geese. The open water pools are surrounded by a zone of hardstem bulrush. At the open water-bulrush interface, new bulrush shoots were abundant and ranged in height from below the existing water column to several feet above the water surface. As elevations increase, the monoculture of bulrush is replaced by a zone of hardstem bulrush clumps interspersed with foxtail barley, goosefoot, saltgrass, clumps of alkali bulrush, and a thin, discontinuous algal mat. Seed production by plants in this zone was extensive. In 1998, this zone was flooded to depths of 1-2 feet, started to dry in early July, but was still saturated the first week of August. Within this zone, snail shells were abundant on the surface. Clumps of hardstem in this zone had new shoot development, but few stems extended above the soil surface. In addition, numerous stems in each clump appeared to be senesced indicating that large changes in the distribution robust emergents has not occurred. This assessment is supported by aerial photography. There is minimal topographic separation between the bulrush and other plants in this zone indicating hydrology is a more important factor than elevation in determining the distribution of plant species. Soil salinities in this zone were 20 ppt. At slightly higher elevations, foxtail barley dominates the plant community.

The west section of the basin is distinct from the east section. The lower, west section, is separated by a low, distinct ridge. The plant zonation is distinctly different in the west section of the basin. At the lowest elevations, salinity of the water was 40 ppt and no emergent plants were present. However, algal mats and patches of foxtail barley seedheads were apparent throughout this unvegetated zone. Although the water column was not sampled to determine invertebrate composition, abundant flies, spiders, and crickets were observed on the soil surface. In addition, a portion of the unvegetated zone contained some surface water that attracted a large number of shorebirds (godwits, avocets, yellowlegs) at the time of inspection. Newly germinated chenopods were abundant at the upper edge of the unvegetated zone. As elevations increase, a concentric band of mature foxtail barley that produced an abundant seed crop replaces the chenopods.

Although the majority of time was spent assessing conditions on Mason Lake, Talbot Lake and Thom Lake were also inspected. Both of these basins are within the Willow Creek drainage and do not appear to have been physically altered, but off-site modifications in hydrology similar to those impacting Mason Lake have occurred. Talbot Lake contains surface water about 2 of every 10 years. The basin has been dry since 1991, but was flooded in 1997 following a 4-inch summer thunderstorm. At the time of inspection, the lowest portion of Talbot Lake was still flooded (<12 inches near the shore) and supported a submerged aquatic community composed of sago pondweed that had produced an abundant seed crop. Algae was also present in lesser amounts. Water salinities ranged from 0-5 ppt. Invertebrates identified within this community included predominantly insects (midges, dragonflies/damselflies, and water boatmen, and backswimmers). At higher elevations, the plant community included least spikerush, foxtail barley, saltgrass, and goosefoot. Thom Lake was currently dry, but was flooded for several weeks following the four-inch precipitation event that occurred in July of 1997. Vegetation identified in the basin included a mixture of facultative wetland grasses.

Habitat Summary

Lake Mason NWR appears to be a good example of a functioning wetland complex. In general, the basins composing the refuge exhibit limited physical modifications. The only physical modification to Mason Lake basin is a water delivery canal that extends from the diversion structure on Willow Creek through the basin. However, the section of the canal within Mason Lake has filled with sediment and is no longer functional. Physical modifications to Lake Talbot and Lake Thom were not evident. Rather, perturbations to the entire system have largely resulted from land use practices on uplands within the watershed, including livestock grazing and water use practices. Such modifications occur at a scale larger than the refuge boundary and involve subtle changes (e.g., soil structure) that are difficult to evaluate without extensive effort; thus, the impacts are difficult to assess. For example, one obvious impact is reduced flow in Willow Creek; however, no information is available regarding alterations to subsurface flows, which may be extremely important (e.g., degree of soil water recharge relative to intensity of summer precipitation events) in determining annual and long-term hydroperiods. The amount of water entering the basins is largely controlled by the volume of water in Willow Creek, which in-turn is determined by snowpack, time of snowmelt, and localized precipitation events. In contrast, drying of the wetland is a function of flooding depth relative to evapotranspiration rate.

Consequently, although man has influenced the hydroperiods by diverting water from the creek, the relative timing and magnitude of the components (precipitation, snowmelt, evapotranspiration) that ultimately determine the annual water budget are variable within and among years. The effects of diverting water from Willow Creek has probably been to reduce the flood frequency of all three basins and/or reduce the extent to which these basins historically flooded. Of equal importance in relation to making habitat available to wildlife are changes in the timing and frequency of flooding on an annual and seasonal scale. Although these two factors undoubtedly have been altered, the magnitude of change is difficult to determine. Regardless of such alterations, however, the dynamic nature of the hydroperiods within each basin have been retained and natural wetland processes within each basin remain largely intact;

indicating the short- and long-term productivity of the basins remains high. Further, these conditions occur naturally without the need for management actions. The following observations support this conclusion. First, dynamic hydroperiods are necessary for the development of the plant zones in Mason and Talbot Lakes. Collectively, these plant species exhibit different germination and establishment requirements as well as tolerances to drought and salinity. Diverse plant communities provide valuable substrate necessary for development of the diverse invertebrate communities and also provide an abundance of different plant foods (e.g., pondweed tubers; seeds of foxtail barley, goosefoot; and browse such as least spikerush) that a diversity of waterbirds can exploit. In addition, each of these plant zones differ structurally (e.g., height, density), resulting in habitats suitable for a diversity of wildlife, ranging from robust emergent vegetation for overwater nesting to mudflats ideal for foraging shorebirds. In the case of Mason Lake, all of these habitats are provided within a single basin.

Second, dynamic hydroperiods are a critical component of maintaining long-term plant diversity (and related food and structural diversity). The type (e.g., plant species) and density of seed that germinates is dependent on numerous factors, including soil moisture, soil oxygen, soil temperature, salinity, and photoperiod. Each of these factors are directly (e.g., soil moisture) or indirectly (soil temperature) influenced by the hydroperiods. Therefore, complete or partial drying of wetlands typically results in time periods within a growing season that differ with respect to germination conditions. During each of these periods a different group of species is likely to germinate. In contrast, stabilization of water levels throughout the growing season typically results in the establishment of only a few plant species because the range of germination conditions is small. If the plants that become established from seed are perennials capable of vegetative reproduction, consecutive years of stabilized water levels can lead to the development of a monoculture. Therefore, a dynamic hydroperiods likely is important in preventing encroachment of the hardstem bulrush in the east section of Mason lake. This is supported by the two observations: (1) bulrush rhizomes observed in the flooded portion of the east section contained numerous, actively growing root shoots indicating expansion in shallowly flooded habitats can occur, and (2) bulrush rhizomes dug in the dry portion of the east section also exhibited some shoot development, but shoots did not appear as vigorous and existing stems exhibited some die-back. As mentioned above, the current distribution of plant species in Mason Lake provides habitats for a diversity of wildlife. In particular, the hardstem bulrush in Mason Lake adds valuable structural diversity to the wetland complex because bulrush is not evident in the other wetlands. However, complete encroachment of this species over the entire east section would result in lowered habitat diversity. Thus, the distribution of bulrush should be monitored to permit early detection of any unwanted encroachment. This is critical because hardstem bulrush, as we discussed, is a perennial plant capable of vegetative reproduction. Further, bulrush has structural adaptations including rhizomes that function as carbohydrate storage organs, and arenchyma cells that allow transport of oxygen from shoots to roots, which can make control difficult because this species is capable of rapidly encroaching across a flooded wetland basin if shoots are above water. Although numerous strategies are known to control bulrushes, successful implementation of such control measures often are difficult due to lack of adequate water control. For example, one strategy is to overtop stems with water (often this is preceded by mowing, discing, or burning to reduce the height of stems). Another strategy in areas with limited water is to dry the wetland basin (often this must be done for two consecutive growing seasons). In the case of Mason Lake, the first strategy would require reducing the height of existing stems because inadequate water is available to overtop current stems. However, even if the height of stems is reduced this strategy may be difficult to implement because the high evapotranspiration rate may result in sufficient water loss so that stems are exposed some time during the growing season. The key to the second strategy is to maintain soils in a dry state to a depth that would reduce the survival of bulrush rhizomes.

Third, dynamic hydroperiods that result in occasional drying (partial or complete) of wetland basins are critical to sustain other abiotic processes. Soil drying is important for chemical processes (e.g., oxidation/reduction) related to nutrient cycling in wetlands. The extent and amount of algal mats in Mason and Talbot lakes suggests that nutrient cycling is intact in these basins. Following the reflooding of these basins, the nutrients bound by algae can be important to support invertebrates and also provide foraging opportunities for certain waterbirds. Drying also helps consolidate sediments suspended in the water column. There is at least some potential for this to be problematic in Mason Lake because we observed unconsolidated sediments in the lowest portions of the east section and the canal constructed through Mason Lake has filled with sediment. Consolidation of sediments can improve water clarity, which can be critical to maintaining some submerged aquatic plants such as sago pondweed.

Wildlife Summary

The primary goals of the refuge, as stated in the draft Environmental Assessment are to provide spring and fall migration habitat, and nesting habitat for migratory birds. Based on refuges records (see General), these goals are currently being met for shorebirds and waterfowl. However, the data that has been collected may not accurately reflect the extent of use by these species during migration and breeding for the following two reasons: First there is turnover of birds using a wetland during migration. However, determining the rate of turnover is difficult because it requires banding and constant enumeration of birds. Thus the peak migrations of shorebirds (15,000) and waterfowl (35,000) may not adequately reflect the total number of birds that use the refuge during migration. Enumerating birds is an inherent problem in identifying values of a site. Historically, peak numbers, number of pairs, or nest success have been used. Because of the mobility of birds, however, there is no assurance that counts on a site are reflective of habitat value. Furthermore, assessing natality is difficult because dabbler broods are secretive and fledging occurs over an extended period. Thus, due to limited time and personnel, biologist have used shortcuts and assumptions to gain insight into production. In the case of Mason Lake, there is little available information regarding actual nest success; thus, production estimates include the following assumptions: (1) all indicated pairs counted, breed on Mason Lake, (2) nest success is 50%, and (3) survival is 5-6 ducklings/brood. However, many of the pairs observed on Lake Mason may not nest on the refuge; rather, they may proceed into the prairie pothole region or elsewhere prior to nesting. In addition, during drier years, the number of indicated pairs decreases to some extent. This does not negate the value of Lake Mason, since it provides important food resources necessary for successful recruitment, regardless of nesting location.

The types of data necessary to resolve these issues require intensive, long-term effort.

Accomplishing such efforts is a dilemma that is common on refuge lands due to constraints of time and available personnel. Due to the location relative to headquarters, and the other responsibilities of the staff, this dilemma occurs on Lake Mason. Thus, some assumptions must be made regarding the value of wetlands on the refuge. Surveys have been adjusted to match the availability of staff time and personnel. Although this approach is not perfect, at least some data of value is available.

Constructing a levee to separate the east and west sections has, in our opinion, a great potential to disrupt the functions that currently maintain the productivity of Lake Mason. The stated purpose of this levee is to impound water at greater depths over a smaller surface area; thereby reducing evapotranspiration losses to the atmosphere and increasing water use efficiency. Although this may result in short-term gains for some species (e.g., improved brood survival during the some years), the long-term consequences would likely be detrimental. Impounding water at deeper depths throughout the growing season on an annual basis would preclude germination/survival of emergent plants currently in the basin. This would result in decreased invertebrate substrate that would alter invertebrate composition and possibly biomass (important for spring migrant and breeding shorebirds and waterfowl) and lowered seed production (important for migrant waterfowl). In addition, the potential for bulrush to encroach across the basin would be increased because the high evapotranspiration rates would result in shallow, warm water being present in the east section in many years. Such conditions are ideal for the encroachment of bulrush. If this were to occur, water use would be increased due to increased transpiration losses, and structural diversity would be decreased (potentially negating use by migrant shorebirds in the east section during subsequent dry years). In addition, a reduction in surface area and food production likely would result in response by fewer breeding pairs over the long term relative to that which occurs with natural variation in a wet/dry cycle.

Impacts to the west section of Lake Mason from dike construction would also be detrimental. Surface flooding of the west section would be curtailed in most years due to water being stored in the east section. This which would alter invertebrate community structure and potentially invertebrate biomass, preclude establishment of valuable food plants and invertebrate substrate at higher elevations due to lack of soil moisture, and preclude use by all avian species in years of no surface water.

One of the dilemmas levee construction is that the levee becomes ideal burrow habitat for common predators of avian nests. Thus, additional problems may include increased nest predation. Currently, the dynamic nature of the hydroperiods results in variable amounts of waterfowl nesting on the refuge. Thus, eggs probably represent an alternative, rather than primary, source of food for mammalian and avian predators. However, if water is impounded annually in the east section to promote duck nesting, predation may increase because some nesting would probably occur every year that the area is flooded. Thus, eggs may represent a more reliable food source. The levee that is constructed may also improve access by mammalian predators, as well as serving as a loafing site for avian (gull) predators. If a borrow area is created (construction material for the levee is obtained on-site), competition for invertebrates may occur if fish enter the wetland. Although all of these consequences may not be realized, and some can be controlled through intensive management, the gains relative to potential losses in natural functions associated with construction of a levee deserves careful consideration. Foremost, is the fact that regardless of the level of construction and the desire to optimize management, a single wetland basin cannot provide all resources to all wildlife in all years.