THURSDAY, 4 FEBRUARY 2016		
Capital D **13:20 - 15:20**	**K.2: Mexico's Rich Waterfowl History, Contemporary Wetland Challenges, and Maintaining Anatid Biodiversity** (Organizers: Eduardo Carrera-González*, Alberto Lafón-Terrazas, Leigh H. Fredrickson)	
13:20	**K.2.1: Carrera-González**	**Introductory Remarks: International Cooperation Across North America a Key to Continental Waterbird Conservation** (Eduardo Carrera-González*, Alberto Lafón-Terrazas, Leigh H Fredrickson)
13:40	**K.2.2: Valverde**	**A Historical Perspective on the Conservation of Waterfowl in Mexico** (Jorge Enrique Mendoza Valverde*)
14:00	**K.2.3: Lafón-Terrazas**	**The Current State of Policy and Legislation Related to Environmental Resources in Mexico** (Alberto Lafón-Terrazas*)
14:20	**K.2.4: Carrera-González**	**Distribution and Status of Mexico´s Wetland Resources** (Eduardo Carrera-Gonzále*)
14:40	**K.2.5: Lafón-Terrazas**	**Initial Efforts for Waterfowl Monitoring in Mexico** (Alberto Lafón-Terrazas*, Mauro Iván Reyna-Medrano)
15:00	**K.2.6: Carrera-González**	**Distribution and Composition of the Mexican Waterfowl Harvest** (Eduardo Carrera-González*, Alberto Lafón-Terrazas, Leigh H. Fredrickson)
15:20 - 15:40	*Coffee break*	
Capital D **15:40 - 17:40**	**L.2: Mexico's Rich Waterfowl History, Contemporary Wetland Challenges, and Maintaining Anatid Biodiversity** (Organizers: Eduardo Carrera-González, Alberto Lafón-Terrazas, Leigh H. Fredrickson)	
15:40	**L.2.1: Lafón-Terrazas**	**Distribution and Productivity of the Mexican Ducks and Related Species** (Alberto Lafón-Terrazas*)
16:00	**L.2.2: Wortham**	**A History of U.S. Flyway Biologists/Pilots' Efforts in Mexico** (Jim Wortham*, Phil Thorpe)
16:20	**L.2.3: Fredrickson**	**Functional Aspect of Wetlands in Mexico's Arid Northern Highlands** (Leigh H. Fredrickson*)
16:40	**L.2.4: Vradenburg**	**Bosque del Apache NWR and Mexico: A History of International Collaboration** (John Vradenburg)
17:00	**L.2.5: Goodman^**	**A Stiff Comparison: Comparing Time-Activity Budgets of Stiff-Tailed Ducks in Puerto Rico** (Nick Goodman*, Jack C. Eitniear, James T. Anderson)
17:20	**L.2.6: Carrera-González**	**Closings Remarks: The Mexico Challenge in North American Waterbird Conservation** (Eduardo Carrera-González*, Alberto Lafón-Terrazas, Leigh H. Fredrickson)

*Speaker; ^Student

K.2: Mexico's Rich Waterfowl History, Contemporary Wetland Challenges, and Maintaining Anatid Biodiversity (Organizers: Eduardo Carrera-González*, Alberto Lafón-Terrazas, Leigh H. Fredrickson)

K.2.1: Carrera-González

Introductory Remarks: International Cooperation Across North America a Key to Continental Waterbird Conservation

Eduardo Carrera-González[1]*, Alberto Lafón-Terrazas[2], Leigh H Fredrickson[3]

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The Anseriformes are the most widely distributed of all avian orders with a distribution globally from the sub-Antarctic islands in the southern hemisphere to the high Arctic islands in the northern hemisphere. This diverse order of 150 species exploits wetland niches across the globe without regard for political boundaries, global landforms, or any boundaries established by humans. The value of this resource associated with wetlands was identified 100 years ago with the Migratory Bird Treaty. This was the first recognition of the large spatial scale implication of protecting this highly migratory group of birds throughout North America in order to assure their existence far into the future.

In 1936 Mexico joined the Migratory Bird Treaty to protect the migratory bird resource and their wetland habitats. Unfortunately the progress that Mexico has made lags well behind the efforts in the United States and Canada in developing state and federal conservation programs, the funding for these programs, and the education of professionals to address the challenges of managing the migratory bird resource and the associated habitats. There is a growing attempt to address these deficiencies by state, federal, and nonprofit groups throughout Mexico. This session focuses on the history of Mexico's efforts to meet the responsibility of protecting and managing the migratory bird resource and their habitats.

K.2.2: Valverde

A Historical Perspective on the Conservation of Waterfowl in Mexico

Jorge Enrique Mendoza Valverde[1]*

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The path to conservation in Mexico took a very different route compared to the United States. Undoubtedly the concentrations of migrant and wintering anatids numbering in the hundreds of thousands during the most social part of the annual cycle in Mexico made concerns for depressed breeding populations difficult to promote at the southern terminous of continental populations until pressure came from the northern breeding areas. Thus interest in continental conservation within Mexico was delayed until 1936 when Mexico became the third country as a signatory to the

Migratory Bird Treaty. Even then pressure to develop national programs were slow to develop. On 2 February 1952, the "Ley Federal de Caza" was published. It was then that hunters as well as diverse wildlife users were aware of "Departamento de asuntos de fauna silvestre" an official authority dealing with the conservation of birds. This Federal Law (Act) was attempting to promote hunting regulations nationwide where traditionally hunters considered wildlife ownership (patrimonia nacional) as a national endowment. For the next 11 years there were actions linked to management concerns expressed in essays by concerned biologists. Then in 1963 Rachel Carson publish Silent Spring which was instrumental in promoting investments in conservation. Unfortunately seven more years passed before management programs were established and the "Direccion General de Fauna Silvestre" was born. This presentation documents the slow but steady development of a national conservation program linked to the protection of continental bird populations through the Migratory Bird Treaty.

K.2.3: Lafón-Terrazas

The Current State of Policy and Legislation Related to Environmental Resources in Mexico

Alberto Lafón-Terrazas[1]*

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Environmental legislation in Mexico related to waterfowl and their habitats, has a degree of complexity that does not allow the flexibility required for decision-making by a single agency. In the case of wetlands, their management and conservation involves at least 20 laws and 11 different agencies at the federal level, plus a similar number of state and municipal departments. Considerations for the management and protection of wetlands in Mexico include a legal framework that range from the Politic Constitution of the United Mexican States, through the General Law of National Assets, the National Water Law and it´s Regulations, Federal Sea law, General Law of Ecological Balance and Environmental Protection, General Wildlife Act and its Regulations, Sustainable Forest Development Act and its Regulations, and the General Law of Sustainable Fisheries and Aquaculture. Added to this array of legislation are international commitments that have to be considered when discussing conservation and / or management of water bodies and wetlands. For the management and sustainable use of animals such as wildlife (geese, ducks and cranes) the following laws and regulations are of importance: General Wildlife Act and Regulations, General Law of Ecological Equilibrium and Environmental Protection, Law Federal Firearms and Explosives Federal Law, Federal Water Law, Mexican Official Standard 059. Despite this legislation, the effectiveness of the waterfowl management and habitat protection requires actions to be implemented at the field level in order to guarantee that wetlands are protected and managed.

K.2.4: Carrera-González

Distribution and Status of Mexico´s Wetland Resources

Eduardo Carrera-Gonzále[1]*

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With 142 wetland ecosystems enlisted as Ramsar sites and a recent published Wetland´s National

Policy, Mexico is looking for ways to guarantee the long term conservation of these important wetland ecosystems. Achieving this goal in Mexico becomes a unique challenge where social and economic development is considered an essential component to improve the quality of life for its citizens.

México has recently recognized the importance and value of their wetland resources, and focused more attention on the conservation of these ecosystems. Protecting wetland areas at state and federal levels was the foundation of historic public policy related to natural resources. As a result, conservation of wetlands tended to be mostly coincidental when the driving interest in developing a protected area happened to also overlap with the presence of wetlands. Thus, wetland conservation was not usually a driving force behind conservation.

Some initiatives have been developed in Mexico to identify and protect Wetlands of International Importance as the most effective mechanism to promote the explicit recognition of the value of wetland ecosystems. Nevertheless, Mexico has made significant progress in inventorying and classifying habitats across the entire country, with an explicit emphasis and priority placed on regions with significant wetland resources for waterfowl and shorebirds. Once in place, these inventories are proving useful as the foundation for promoting subsequent conservation activities by local, state and federal governmental entities, as well as non-governmental conservation organizations.

Wetland inventory information is a valuable tool to support management and conservation decisions to guarantee wetland viability for wildlife and man because of the major threats these wetland ecosystems are facing from urbanization, aquaculture, and agriculture. The available literature, official information, and results obtained with the current efforts resulting from the wetland inventory and classification about the distribution, function, and value of wetlands in Mexico still lacks a comprehensive overview of wetland ecosystems. These short comings should direct more attention to wetland efforts for a great number of resident and migratory wildlife species that are directly depending on wetlands to fulfill their life cycle needs.

K.2.5: Lafón-Terrazas

Initial Efforts for Waterfowl Monitoring in Mexico

Alberto Lafón-Terrazas[1]*, Mauro Iván Reyna-Medrano[2]

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The development of monitoring programs for waterfowl and other waterbirds in Mexico have developed slowly. This presentation document the results of an initiative of DGVS Dirección General de Vida Silvestre – General wildlife management- from SEMARNAT Secretaría de Medio Ambiente y Recursos Naturales – Ministry of Environment and Natural Resources and the combined effort by state and federal governments, research and education institutions as well as a diversity of non- governmental organizations that conducted a waterfowl survey in different regions of the country. This task required the integration of multi-disciplinary, inter-institutional teams that collaborated under a tight budget.

Before inventory implementation, meetings were held to develop a methodology appropriate for the diversity of habitats to be surveyed. Adjustments in methodology were made for each region and

especially for areas with marine and mangrove swamp environments. A training software was used to assess individual and group ability to conduct inventories. This training resulted in techniques designed to improve accuracy. These techniques led to determine a national average error between 14% and 18% which was accepted as adequate, considering the limited training provided for participating technicians.

Areas were selected for inventories and then prioritized based on high waterfowl use and personnel to conduct the inventories. Furthermore to optimize the use of resources, support from other organizations were included. With support from other organizations, SEMARNAT delegations and private individuals, inventories were implemented in 4 regions and 15 States, including 85 specific sites such as lakes, lagoons, and other water reservoirs. The inventory was conducted by 123 technicians who used 5 airplanes in Chihuahua, Yucatán, Coahuila, Zacatecas and Durango states, 4 airboats in Sinaloa and Nayarit plus 14 boats and rafts and 21 vehicles throughout Mexico.

Results indicated 21 species of ducks, 5 species of geese as well as 31 other wetland associated species were encountered. Total encounters included 918,834 ducks and 131,931 geese. Nevertheless, it is important to remember that important waterfowl areas such as Tamaulipas and the peninsula of Baja California were not part of this survey and that estimates have been made for as many as 7 million wintering waterfowl in Mexico. This single attempt at a nationwide coordinated survey suggests more logistic and monetary support is still needed to carry out a waterfowl survey that provides information as well as answers to questions regarding the necessary administrative organization for the conservation of natural resources in Mexico.

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K.2.6: Carrera-González

Distribution and Composition of the Mexican Waterfowl Harvest

Eduardo Carrera-González[1]*, Alberto Lafón-Terrazas[2], Leigh H Fredrickson[3]

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To properly manage migratory waterfowl on a continental basis, an accurate, systematic and annual estimate of waterfowl harvest in North America is essential. Unfortunately the sophisticated programs necessary to assess harvest in Mexico lags behind those of the United States and Canada. Efforts to assess a national waterfowl harvest in Mexico have failed because the focus has either been on some localized regions or for specific wetlands. Unfortunately the federal government has lost its authority to enforce the law or to establish a system for the collection and use of important information as a tool to improve wildlife management and conservation decisions. Thus the decentralization of wildlife management to some northern Mexican states as well as the way wildlife is managed in Mexico compromises the efforts to collect these harvest data country wide.

In 1995 the first and only effort to determine waterfowl harvest and hunter activity nationwide was conducted throughout Mexico with less than 100,000 waterfowl harvested annually in the most important and traditional sites of waterfowl use in Mexico. Since then, no other effort to guide harvest management decisions has been conducted to estimate total waterfowl harvest, species composition or origin of hunters.

Since the mid-1990s, changes in wildlife management were made in the administration and system operations, unfortunately data gathering remains limited. Thus, this deficiency reinforces the need to establish a national program that guarantees harvest data collection. At present just partial data from harvest and the economic benefits from hunting activity exist in Mexico. These limited data remain valuable as a justification to encourage the federal government to help launch the Mexican Wildlife Fund which supports wildlife conservation but with a focus on those species with economic importance.

L.2: Mexico's Rich Waterfowl History, Contemporary Wetland Challenges, and Maintaining Anatid Biodiversity (Organizers: Eduardo Carrera-González, Alberto Lafón-Terrazas, Leigh H. Fredrickson)

L.2.1: Lafón-Terrazas

Distribution and Productivity of the Mexican Ducks and Related Species

Alberto Lafón-Terrazas[1]*

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One of the conservation initiatives in Mexico focuses on six native species (Mexican duck, muscovy duck, fulvous whistling duck, black-bellied whistling duck, mottled duck, and masked duck). Unfortunately conservation efforts are primarily through publicity and nesting boxes which have largely failed to meet conservation goals. Foremost among the compromising factors is the lack of basic information about these species including ecology, populations, and distributions.

Some information is available for the muscovy duck (*Cairina moschata*) and the triguero duck (*Anas diazi*). For example the distribution of the triguero duck appears to be expanding beyond the Mexican Altiplano mainly to the Pacific coast (Sonora, Sinaloa and Nayarit). Today the species is reported in areas where it was nonexistent two decades ago and in some areas is abundant enough to cause crop damages. In the case of the resident mottled and masked duck there is so little information that information is lacking on both abundance and distribution. This lack of information is of concern to properly protect these resident birds before they might be exploited.

L.2.2: Wortham

A History of U.S. Flyway Biologists/Pilots' Efforts in Mexico

Jim Wortham[1]*, Phil Thorpe[1]

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The U.S. Fish & Wildlife Service enjoys a rich history of cooperation with Mexico in monitoring and managing our shared waterfowl resources. From the early day when George and Dorothy Saunders explored the northern highlands with their Jeep, "Chico", or in 1947 when Flyway Biologists/Pilots first flew waterfowl surveys in Mexico piloting a WWII surplus Grumman Goose to the present, we have identified that Mexico has important implications for annual ecology of many North American migratory birds.

Waterfowl surveys within Mexico evolved to become regularly scheduled aerial surveys across the east coast, central highlands, west coast and Baja. Some surveys such as those for Gulf Coast redheads or Pacific black brant were conducted annually, while other broad scale surveys were completed every third year and included habitats in nearly every State within Mexico. Still only a fraction of the ducks, geese, and other marshland birds living or wintering below the U.S. border were observed and many crucial habitats remain poorly understood. For certain species, such as black brant or white-fronted geese, wintering monitoring efforts within Mexico became an important part of continental population management plans. However, most surveys were aimed at providing general trend analyses or identifying patterns of distribution of birds within Mexico.

Presently, many of these FWS-supported aerial surveys in Mexico have fallen victim to budget cuts and security concerns. More support is needed to prioritize information needs and to design statistically viable monitoring surveys to meet those demands. One solution is to continue cooperative work with Federal, State, academic institutions, and NGOs within Mexico to further develop aerial survey resources in-country to complement FWS capabilities. Earlier collaborative workshops have been successful in sharing survey design and operational techniques and in mentoring Mexican natural resource pilots. In addition, emerging aerial remote sensing technologies can be explored for potential application to environmental pressures imposed on waterfowl or their habitats.

L.2.3: Fredrickson

Functional Aspect of Wetlands in Mexico's Arid Northern Highlands

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The southern terminus for significant numbers of North American waterbirds is found in the arid highlands of northern Mexico which seems like an unusual place to have a high concentration of wetland dependent birds. Nevertheless, in the Mexican states of Chihuahua, Durango, and Zacatecas there are significant areas of alluvial fans, playa like basins, and shallow lakes that provide diverse wetland resources on an erratic basis because of the variability associated with the climatic, topographic, and geomorphic setting in an arid mountain systems with monsoonal influences from Pacific air movements. Diverse taxonomic groups take advantage of these desirable wetland conditions with abundant foods. Among these are migrant and wintering anatids, gruiforms, and chadriiforms. Large numbers of white-fronted and snow geese along with a mix of dabbling ducks including teal, wigeon and pintail are joined by resident Mexican ducks. Sandhill cranes and long-billed Curlew's occur in significant numbers along with a number of different shorebirds. Historically a few whooping cranes also exploited these habitats.
The unique combination of monsoonal rains that occur erratically across the states in summer and the geomorphic conditions associated with these landforms, soil textures, and subsurface hydrology create ideal bare mineral soil substrates for the germination of wetland plants that have adequate hydrologic inputs for growth and a potential for flooding at the time of fall migration because of changes in temperature and transpiration.

Unfortunately these wetlands are under siege by a variety of factors including urbanization and agriculture. Undoubtedly rapidly changing agricultural programs are having a negative impact on the presence and condition of many wetland basins. These modifications are especially disconcerting in Mexico because their conservation programs are in the early stages of development and reflect the challenges that the United States faced in the 1930s and 40s.

L.2.4: Vradenburg

Bosque del Apache NWR and Mexico: A History of International Collaboration

John Vradenburg[1]*

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Effective landscape level wetland management requires an appreciation for resource production, distribution, and availability across large scales as well as sharing expertise and coordinating actions among professionals across political boundaries. A good example of successful collaboration across political boundaries is the effort at Bosque del Apache NWR, a refuge well known for providing important wetland resources for wetland dependent waterbirds in New Mexico. Historically Bosque del Apache NWR along with other sites in the Middle Rio Grande Valley were stopover sites for migrating waterbirds winging south into the wetland rich areas of the Mexican Highlands.. Changes in distribution, timing, and energetic value of wetland and agricultural resources in the Middle Rio Grande Valley resulted in over wintering of some waterbird populations further north than occurred historically such as the entire Rocky Mountain Population of Greater Sandhill Cranes which now

winters in southern New Mexico with few individuals venturing into traditional wetland wintering areas in Mexico. Biologist at Bosque del Apache NWR understood that the more information for annual conditions in Mexico guided the more effective distribution of food resources to maximize waterfowl use in New Mexico and to promote migration to Mexico. In the early 1990s, biologists from Bosque del Apache NWR began conducting annual wetland and agriculture surveys in Chihuahua, Durango, and Zacatecas with the goal to establish an enhanced working knowledge of habitat conditions in northern Mexico to coordinate with understanding wetland and crop energetic value throughout the Middle Rio Grande Valley in combination with management efficiency of Bosque del Apache NWR. This effort partitioned food resources to when and where birds most needed them in New Mexico. Because of this large scale effort, international relationships developed and evolved between colleagues of both nations. Collaboration with the University of Chihuahua and nonprofits like Profunda and DUMAC fostered questions that developed into graduate research programs that spanned international boundaries. Bosque del Apache NWR provided technical and monetary support for several Mexican students and conversely Mexico housed and supported students from several universities. International work and current efforts strive to further enhance the relationships across the international border through workshops, mentoring, and increased collaboration.

L.2.5: Goodman^

A Stiff Comparison: Comparing Time-Activity Budgets of Stiff-Tailed Ducks in Puerto Rico

Nick Goodman[1]*^, Jack C. Eitniear[2], James T. Anderson[1]

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Puerto Rico harbors three taxa of stiff-tailed ducks: Masked Duck (*Nomonyx dominicus*), Northern Ruddy Duck (*Oxyura jamiacensis jamaicensis*), and West Indian Ruddy Duck (*Oxyura j. jamaicensis Gmelin*). These duck taxa are commonly located in the same wetlands and have similar niches, yet information is lacking about their behavior, habitat use, and niche partitioning. Time-activity budgets are useful in collecting this information and understanding species ecology. We collected 24 hour time-activity budgets on each taxa of stiff-tailed ducks in Puerto Rico from January to April 2015 by observing them for 5 consecutive minutes and recording a behavior activity every 10 seconds. The behavioral activities were classified using 8 categories: (1) Aggression, (2) Feeding, (3) Inter-dive loaf, (4) Resting, (5) Locomotion, (6) Courtship, (7) Comfort movement, and (8) Sleeping. We tested these 8 activities using multivariate analysis of variance for differences among taxa, between sexes, and among sampling times (3 diurnal and 3 nocturnal). We collected a total of 1,647 behavioral observations: Masked Duck n=93, Northern Ruddy Duck n=1,246, and West Indian Ruddy Duck n=308. Our results from the first of 2 field seasons indicate that all activities except aggression, inter-dive loaf, and courtship differed among taxa and sampling times, while the activities rest and sleep differed between sexes ($P<0.05$). The most common activity varied by taxa: Masked Duck (locomotion; 35.2%), Northern Ruddy Duck (sleep; 30.1%), and West Indian Ruddy Duck (rest; 33.1%). This comparison of preliminary data shows that the 3 taxa of stiff-tailed ducks behave differently. Another field season along with additional data analyses should yield valuable information to improve management and conservation of all 3 taxa.

L.2.6: Carrera-González

Closings Remarks: The Mexico Challenge in North American Waterbird Conservation

Eduardo Carrera-González[1]*, Alberto Lafón-Terrazas[2], Leigh H Fredrickson[3]

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Mexico faces many of the same challenges associated with habitat degradation throughout North America and around the globe. In the case of Mexico many of these changes have occurred recently and have progressed at a very rapid rate. These changes have important implications for the long term sustainability of habitats that support both resident and migratory species. To be a full participant in the migratory bird treaty Mexico is making a more concerted effort to engage in the conservation movement in many different ways but the challenges are great and resources are few. Foremost among these initiatives are the building of a professional core of individuals with adequate education and experiences to deal with this broad array of challenges. Within this framework the expertise provided by nations with a long and more comprehensive approach to conservation of the migratory bird resource is an essential ingredient for a more rapid development of programs in Mexico. This wrap up is an attempt to summarize these efforts and to identify key ways in which support is likely possible from within Mexico and from beyond its borders.