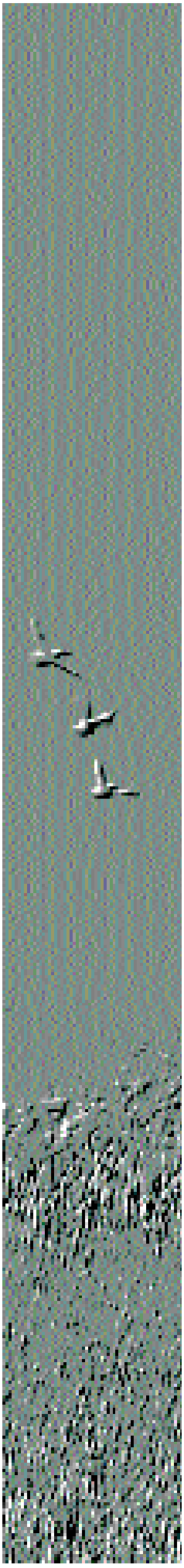


Chapter 1
History of the Las Vegas Wash

Millions of Years Ago – The Wash was Created

The Las Vegas Wash (Wash) floodplain was initially formed roughly two to 24 million years ago, as a result of filling of the Las Vegas Valley (Valley) by sediments that were deposited by erosion of surrounding ranges and higher elevations. The majority of these sediments consist of easily eroded silts and clays with minor amounts of sand and gravel. Geologic evidence indicates that the Wash has undergone at least three natural cycles of down-cutting and subsequent back-filling prior to modern development. The Wash became a tributary to the Colorado River about three million years ago (Glancy, 1999).

For the last few hundred years, the Valley has been a source of water in the dry Mojave Desert. Meadows, or wetlands, were supported by a spring complex known as the Big Springs, located in the central part of the Valley. Las Vegas Creek was formed by these springs and flowed through the Valley, percolating into the ground water system prior to entering the lower portion of the Wash. The lower part of the Wash was ephemeral with the exception of a small spring and wetland area near what is now known as Three Kids Wash.

More information on the prehistoric and early history of the Wash can be found in Chapter 3, Erosion in Las Vegas Wash.

Early 1900s – Modern Settlement Causes Flows in Wash to Increase

At the turn of the century, the Wash was for the most part an ephemeral stream, carrying storm flows to the Colorado River. A few mesquite were

present in the Wash, as well as a small wetland located at a spring just above what is now know as Three Kids Wash. Flows in the Wash measured prior to 1928 recorded perennial flows of one cubic foot per second (cfs).

Flows in the Wash increased proportionally with population expansion in the Valley. Modern settlement followed construction of the railroad linking Salt Lake City, Utah, with Los Angeles, Calif., in 1905. The Valley grew at unprecedented rates during construction of Hoover Dam in the 1930s, World War II related activities in the 1940s, and accelerated growth of the gaming and entertainment industry in the 1950s. Since then, a steady and increasing influx of residents to the Valley has caused flows in the Wash to permeate and moisten the floodplain, transforming its vegetation from a sparse, desert-shrub community to a greenbelt that included ponds and wetlands. This progressively increasing floodplain saturation caused the Wash to begin flowing continuously in 1955, a drastic change in the hydrologic regimen from the previous 2,500 years (Glancy, 1999). Figure 1.1 is an aerial photo of the Wash in 1950.

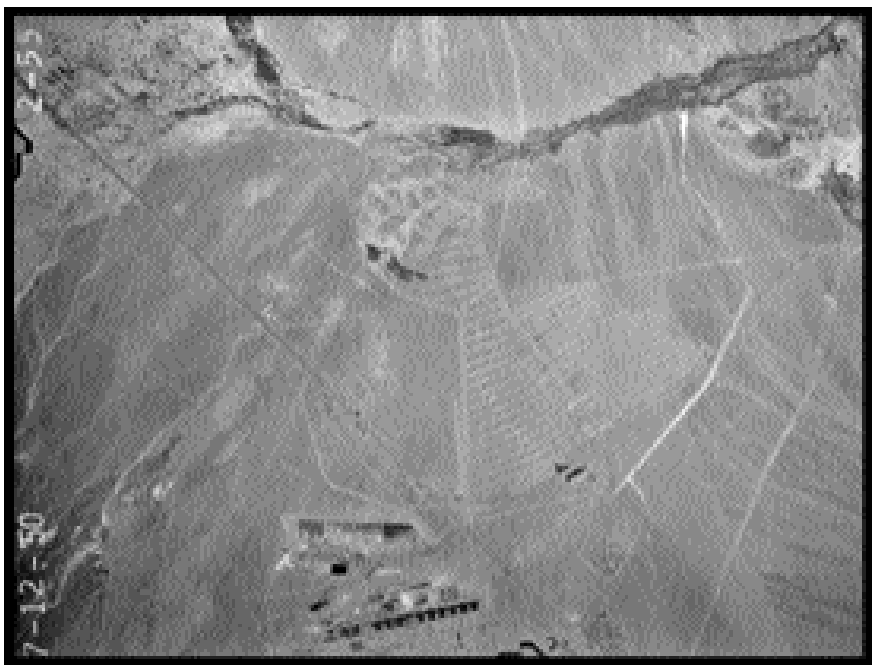
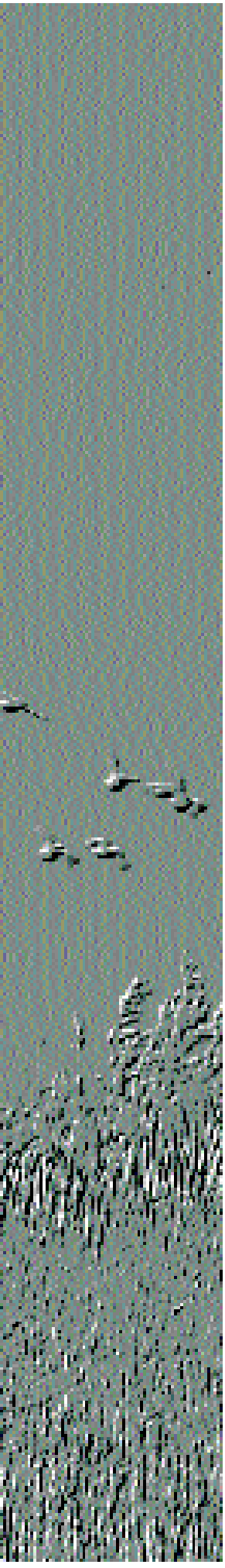


Figure 1.1 - Aerial photo of the Wash, 1950.

1950s – Population Growth Demands Wastewater Treatment

In the early 1950s, treatment of sewage in the Valley was by means of cesspools, septic tanks and several small treatment plants mainly operated by hotels along Las Vegas Boulevard. Urban coverage (i.e., developed land) in the Valley was approximately 12,000 acres in 1950 (SNWA, 1999), and continuing growth of both the tourist and residential portions of the community demanded more sanitary and efficient means of treating wastewater. So, in August 1954, the Clark County Sanitation District (CCSD) was created. A year later, Clark County residents approved construction of a collection system (pipelines) and wastewater treatment facility (the West Plant) and, in November 1956, the CCSD began receiving sewage from the community at these facilities (Clark County Sanitation District, 1999). The West Plant had a treatment capacity of 12 million gallons per day (mgd).



Around the same time, the City of Las Vegas decided to relocate their 7.5 mgd trickling filter treatment plant from in town (located on the southwest corner of Mojave Road and Harris Avenue) to its present location near the Wash. By 1957, the relocated wastewater treatment plant and an accompanying new sewer system were in operation (City of Las Vegas, 1999). Today this facility is named the City of Las Vegas Water Pollution Control Facility.

As the Clark County Sanitation District and City of Las Vegas began discharging wastewater into the Wash in 1956 and 1957, respectively, wetland vegetation in the Wash was further enhanced, an event that hadn't occurred naturally prior to steady influx of residents to the Valley starting in the 1950s.

1957 – Headcutting Starts in Wash

Increasing volumes of treated wastewater caused increasing flows in the Wash. This was monitored by stream gaging conducted by the U.S. Geological Survey (USGS) at Pabco Road beginning in 1957. The USGS continued to quantify the increase in stream flow over time (Glancy, 1999). The measurement of flows in the Wash (from 1980 to the present) is discussed in more detail in Chapter 2, Flows in Las Vegas Wash.

In 1957, a flood event caused minimal erosion in the Wash and, although the floodplain absorbed most of the water, headcutting started (Whitney, 1999).

1960s – Wastewater Increases Intensify Erosion and Wetlands Start to Disappear

By 1960, wastewater flows in the Wash had increased to just less than 10 mgd (15 cfs) and the Valley's population had grown to approximately 119,000 people (CCDCP, 1994). Urban coverage (i.e., developed land) in the Valley was approximately 22,000 acres in 1960 (SNWA, 1999).

Growth of wetland vegetation in the Wash, promoted by wastewater discharge from the Valley, was unable to keep pace with the rate of wastewater increases. Although there was enough surface water in the mid-1960's to provide marsh habitat for birds (Whitney, 1999), most excess water not used by the vegetation began to erode the fragile floodplain underlain by unconsolidated, fine-grained sediments (Glancy, 1999).

In July 1968, the first community-wide effort to solve Las Vegas Bay pollution problems was initiated. The Interagency Water Pollution Control Task Force was formed and acted as a Technical Advisory Committee to the Clark County Board of Commissioners.

A year later, in 1969, erosion became visually evident when daily average flow in the Wash was about 24 mgd (37 cfs). Two sites, where Three Kids Wash enters the Wash, and where the Northshore Road crosses the Wash, displayed channels that cut through marsh habitats (Whitney, 1999) and erosional headcutting at the downstream ends of road culverts. Lateral confinement of stream flow by the culverts caused flow velocities to increase proportionally (Glancy, 1999).

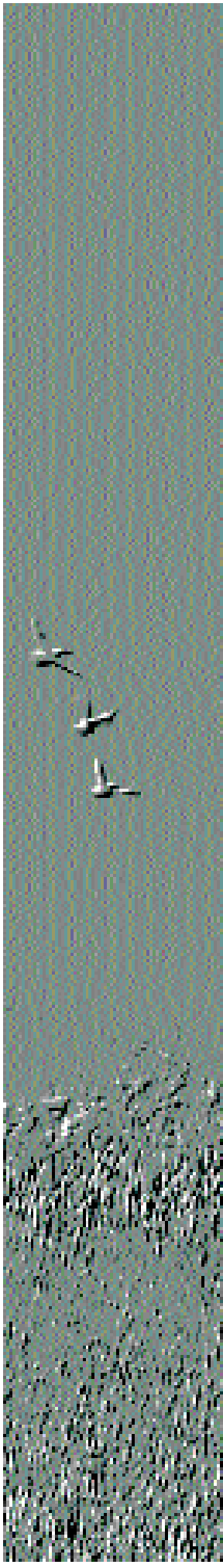
1970 – Las Vegas Lateral is Constructed in the Wash

The Las Vegas Lateral was constructed in 1970-1971 as part of the Southern Nevada Water Project, now known as the Robert B. Griffith project. The lateral was built as one of the distribution pipelines, which brought treated water into the Valley from Lake Mead, and extends seven miles from the outlet portal of the River Mountains tunnel, through the Henderson Bifurcation, to the Whitney Bifurcation. At that point the lateral ends, and the Whitney and North Las Vegas Laterals begin (U.S. Bureau of Reclamation, 1983). The lateral was installed by trenching into the Wash, with the assistance of dewatering wells. Some disturbance to Wash bedding occurred during this process, and the U.S. Bureau of Reclamation (USBR) was initially concerned with backfill compaction of new materials. However, compaction turned out to be better than or equal to what was previously there (DiTripani, 1999). The lateral, which is no longer in use, varied in diameter from 90-96 inches depending on location, and had a capacity ranging from 261-289 cubic feet per second (cfs) (U.S. Bureau of Reclamation, 1983).

Early 1970s – Headcutting Advances 5,000 Feet Upstream

By 1970, wastewater flows in the Wash had increased to approximately 25 mgd (39 cfs) and the Valley's population had grown to approximately 262,000 people (CCDCP, 1994). Urban coverage in the Valley had increased to approximately 40,000 acres by 1970 (SNWA, 1999), an 82 percent increase over the previous decade.

These increasing wastewater flows continued to cut and destabilize the Wash during the 1970s (Figure 1.2). A 1975 flood event increased headcutting (Whitney, 1999) and, over the next four years, headcutting advanced 5,000 feet upstream (Hester, 1999). In 1975, marsh habitat was particularly noted to be in decline (U.S. Bureau of Reclamation, 1987), and the amount of wetland vegetation (excluding tamarisk) along the Wash, from Desert Inn Road to Lake Las Vegas (constructed in the early 1990's), was roughly 1,420 acres. This provided an abundance of habitat for wildlife living in the Wash. At this time, there were only about 260 acres



of tamarisk in the Wash (U.S. Bureau of Reclamation, 1987). See Appendix 1.1 for a more comprehensive look at vegetation in the Wash from 1975 to 1986.

The Wash channel was often degraded sharply and suddenly during short-term surges of floodwaters from storm events. These floodwaters widened the channel, accelerated upstream migration of headcuts and contributed greatly to drainage and deterioration of the wetland vegetation (Glancy, 1999).

Figure 1.2 - Photo of the Wash, 1975 (Vernon Bostick).

1973 – Sewage and Wastewater Advisory Committee is Organized

In July 1973, the Sewage and Wastewater Advisory Committee (SWAC) was organized as required by NRS 244A. The SWAC was comprised of technical employees from municipalities or districts who were actively engaged in the operation or management of sewer or water facilities within Clark County to advise the Board of County Commissioners on wastewater issues.

1973 – Clark County Sanitation District Constructs New Wastewater Treatment Plant

In 1973, the Clark County Sanitation District, located east of Boulder Highway on Flamingo Road, constructed their East Plant, thereby increasing total wastewater treatment capacity to 32 mgd. Both East and West Plants are primary sedimentation and trickling filters to provide secondary treatment to the Valley's wastewater.

1973 – Las Vegas Wash Development Advisory Committee is Organized

In 1973, a Las Vegas Wash Development Advisory Committee was organized by local citizens and representatives from various agencies for the purpose of making recommendations to the Board of County Commissioners on how to restore wetlands in the Wash. Because the committee was not in a position to make decisions, they later recommended to the Board that a Task Force be established to find solutions to erosion problems in the Wash. The Task Force was not established until 13 years later, in 1986.

1977 - 1978 – Section 208 Water Quality Management Plan Issued

In April 1977, the first Section 208 water quality reports were published for Clark County. Four of the reports dealt with the following four Wash-related issues: Las Vegas Wash development and coordination with waste-water treatment facilities, salinity control, recreation and flood control aspects.

A year later, in July 1978, the Clark County Board of Commissioners transferred water quality planning functions from the Clark County Sanitation District to the Clark County Department of Comprehensive Planning. That same year, the board adopted the Clark County 208 Water Quality Management Plan, which presented objectives, policies and programs for managing water quality in the county, including the Wash. Since 1978, there have been numerous amendments to the Section 208 Water Quality Management Plan.

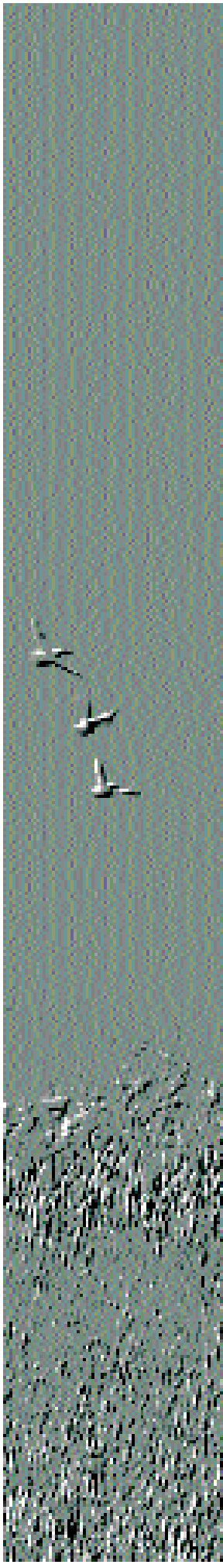
1978 – Construction of the Northshore Bridge

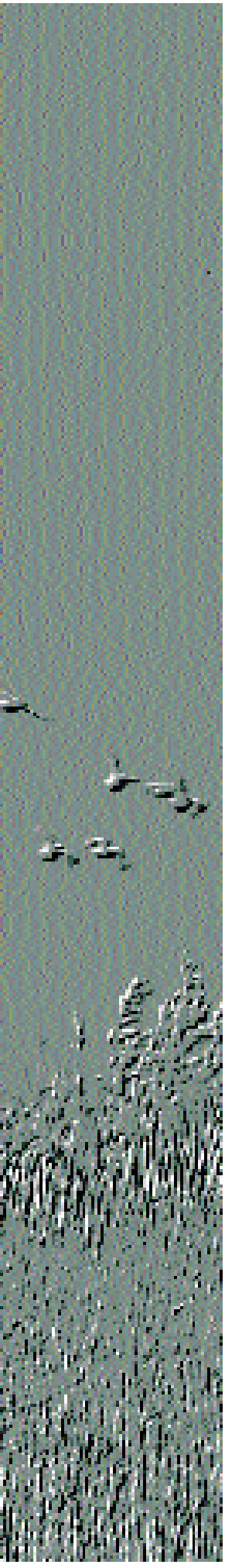
Construction of the Northshore Bridge in 1978, where the Northshore Road crosses the Wash, replaced earlier installed culverts and allowed the head-cutting to advance upstream even further. This headcutting would cause the need for reconstruction and deeper burial of the Las Vegas Lateral, a pipeline upstream beneath the Wash that carried water from Lake Mead to the Valley. At this time, headcutting and erosion had significantly reduced riparian wetlands and drained a substantial part of the shallow ground water reservoir beneath the floodplain of the Wash, which supported the wetlands.

1979 – Water Quality Study Board & Las Vegas Valley Water Quality Program Formed

In March 1979, the Cities of Las Vegas and North Las Vegas, Clark County, the State of Nevada and the EPA entered into a Consent Decree agreeing on certain effluent limitations for the Wash and Lake Mead. It established a planning process to address other related issues such as treatment facilities planning, use of the Wash and reuse of effluent. A multiple jurisdictional planing board, the Water Quality Study Board, was formed to manage what would be new water quality standards and wastewater treatment facilities' planning efforts for the Valley. This program was called the "Las Vegas Valley Water Quality Program."

The Water Quality Study Board was comprised of representatives from Clark County, the Cities of Las Vegas and North Las Vegas, the State of





Nevada and the EPA. Their task was to be the governing body directing both water quality and treatment facilities' studies. The sunset for this board was June 1, 1981.

Early 1980s – Headcutting Advances 9,000 Feet Upstream

By 1980, wastewater flows in the Wash had increased to approximately 58 mgd (90 cfs), the Valley's population had grown to approximately 444,000 people (CCDCP, 1994) and urban coverage in the Valley had increased to approximately 91,000 acres (SNWA, 1999).

By the mid-1980s, wastewater flows in the Wash had grown to average 100 cfs, and many erosional headcuts were active along the six-mile reach of the lower Wash, from Pabco Road to Lake Mead. From 1979 to 1984, headcutting advanced 9,000 feet upstream (Hester, 1999) and severe erosion continued throughout the decade, even during times of minimum flow (Glancy, 1999).

In 1982, total acreage of marsh habitat in the Wash had been reduced 80 percent, from what it was in 1975. During the same period, salt cedar increased dramatically throughout the entire Wash (U.S. Bureau of Reclamation, 1987). Three years later, in 1985, total wetland vegetation (excluding tamarisk) in the Wash, from Desert Inn Road to Lake Las Vegas (constructed in the early 1990s), covered approximately 1,260 acres (U.S. Bureau of Reclamation, 1987). This was a decrease of 160 acres from 1975, a 12 percent decrease. Acreage of tamarisk was approximately 579 acres in 1985. See Appendix 1.1 for a more comprehensive look at vegetation in the Wash from 1975 to 1986.

1982 – Clark County Board Approves Master Planning Efforts for Wash

On Sept. 3, 1982, a preliminary master plan was completed by Clark County Departments of Parks & Recreation and Comprehensive Planning and approved by the Clark County Board of Commissioners. There was considerable agency and public involvement during development of the document, which was largely the result of efforts of the Las Vegas Wash Development Advisory Committee.

1982 – Clark County Advanced Wastewater Treatment Plant Constructed

To meet water quality standards, as well as the increasing needs of wastewater treatment for the Valley, the Clark County Advanced Wastewater Treatment Plant (AWT) was constructed in 1982 for the purpose of providing additional treatment of wastewater in order to better protect the Wash and Lake Mead (Clark County, 1999). The AWT provided a wastewater

treatment capacity of 90 mgd and further treated effluent from the existing CCSD East and West Plants by using chemical coagulation and filtration to remove phosphorus from the wastewater.

1984 – Flood Events Remove More Sediment from Wash

During the summer of 1984, there were multiple flash floods caused by a prolonged monsoonal period, resulting in more than 4.25 million cubic yards of sediment being transported to Lake Mead -- more than the equivalent amount of concrete required to build Hoover Dam (Whitney, 1999). These flood events caused the numerous erosional headcuts to be integrated and greatly widened the flowpath, thereby transforming the channel into a continuous trench from Pabco Road to the mouth at Lake Mead. The Wash suffered extensive damage in July 1984 as peak flows reached some of the highest levels on record (USBR, 1987). During the next four years, headcutting advanced more than 4,400 feet upstream (Hester, 1999). This severe erosion effectively completed destruction and drainage of most of the wetlands downstream from Pabco Road (Glancy, 1999).

1984 – Temporary Grade Control Structure Built

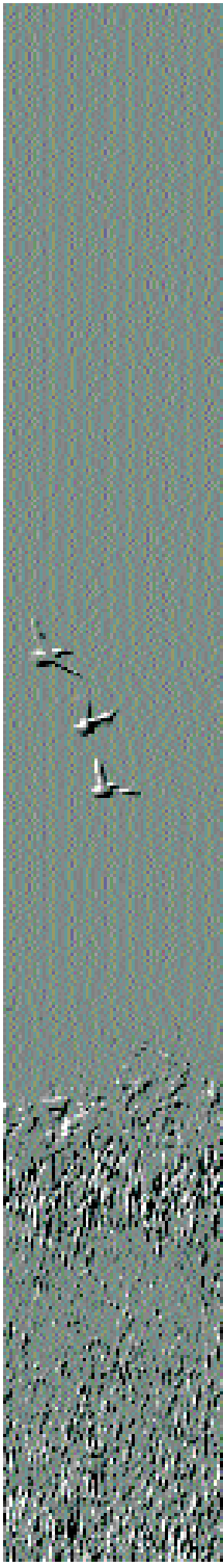
A temporary Grade Control Structure (GCS) was built in 1984 by the Colorado River Commission (CRC) to protect the Las Vegas Lateral, the pipeline carrying potable water from Lake Mead to the Valley, buried beneath the Wash. The GCS was built as a temporary means of protecting the lateral when erosion threatened its viability. The GCS was designed to last for approximately two years, but actually remained in the Wash (with frequent repairs) until 1999.

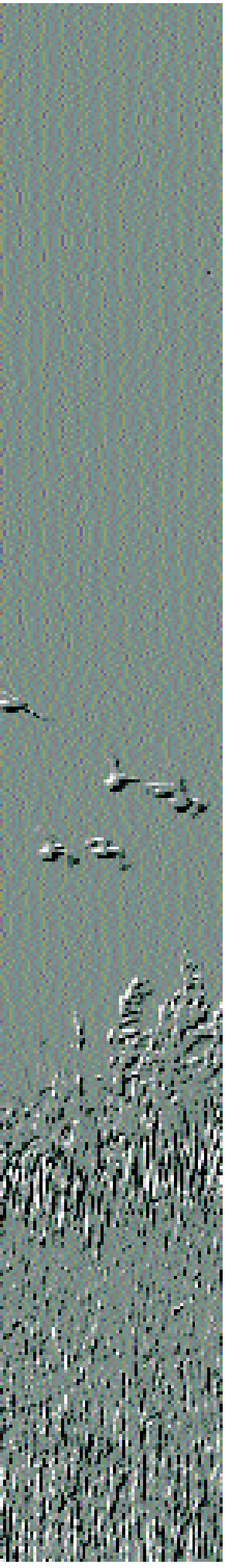
1985 – Clark County Regional Flood Control District Created

In 1985, the Nevada Legislature created the Clark County Regional Flood Control District (CCRFCD) for several purposes: to develop a coordinated and comprehensive Master Plan to address flooding problems, regulate land use in flood hazard areas, fund and coordinate construction of flood control facilities (including facilities in the Wash), and develop and contribute to funding of a maintenance program for the Master Plan's flood control facilities (Clark County Regional Flood Control District, 1999).

1986 – Temporary Grade Control Structure is Maintained

After investigating the most feasible and cost-effective method of protecting the Las Valley Lateral from even further erosion, the CRC decided in





1986 to relocate a portion of the lateral in a tunnel below the Wash. Soon after this decision, the USBR recommended to CRC that the retired portion of the pipeline and temporary GCS be disposed upon relocation of the lateral for the purpose of ensuring public safety and eliminating potential liabilities.

However, upon hearing USBR's recommendation, Clark County advised CRC that either Clark County or the Clark County Regional Flood Control District (CCRFCD) may have an interest in acquiring the temporary GCS for the purpose of avoiding further erosion in the Wash. At this time, CRC entered into an agreement with Lake Las Vegas for interim operation and maintenance of the structure (conducted by Lake Las Vegas). Ownership transfer of the GCS did not take place until it was transferred to SNWA in January 1996.

1986 – Clark County Establishes Task Force to Address Erosion in Wash

Clark County established a Task Force in 1986 to find solutions to erosion problems in the Wash. The severity of problems was recognized as the result of a number of factors: 1) the CRC spent more than $9 million to bury a new lateral (the Las Vegas Lateral was exposed during the 1984 flooding), 2) increases in ammonia levels in Lake Mead caused the State Environmental Commission to pass a resolution calling for Clark County to restore the wetlands in the Wash, which had been helping to polish wastewater entering Lake Mead, and 3) owners of other structures in the Wash, such as the Silver Bowl and private developments near Duck Creek, voiced concerns that their structures might be damaged by future erosion in the Wash.

The Task Force determined that the best source of funding for an erosion control plan for the Wash was to seek authority from the Nevada State Legislature to add a water surcharge. As a result, in March 1987, Nevada State Senate Bill No. 243 was proposed. The bill was to impose a fee on water users from the Colorado River to provide money for the maintenance of the Wash and require that the money be used to control erosion and preserve the quality of water in the Wash. The bill never gained enough support to pass and become law.

1988-1989 – Integrated & Comprehensive Management Program Developed

In 1988, Clark County established the Las Vegas Wash Integrated and Comprehensive Management Program (ICMP). The primary goal of this program was to control the ongoing natural resource degradation while capitalizing on the many unique opportunities available within the Wash (Kennedy/Jenks/Chilton, 1989).

The ICMP identified four priority focus elements: 1) erosion control, 2) flood control, 3) development of a Wetlands Park, and 4) wastewater treatment. One year later, Clark County formulated a component of the ICMP, an Erosion Mitigation Plan, that recommended a system of erosion control structures and other practices to reduce erosion in the Wash (Kennedy/Jenks/Chilton, 1989).

Early 1990s – Lake Las Vegas Constructed

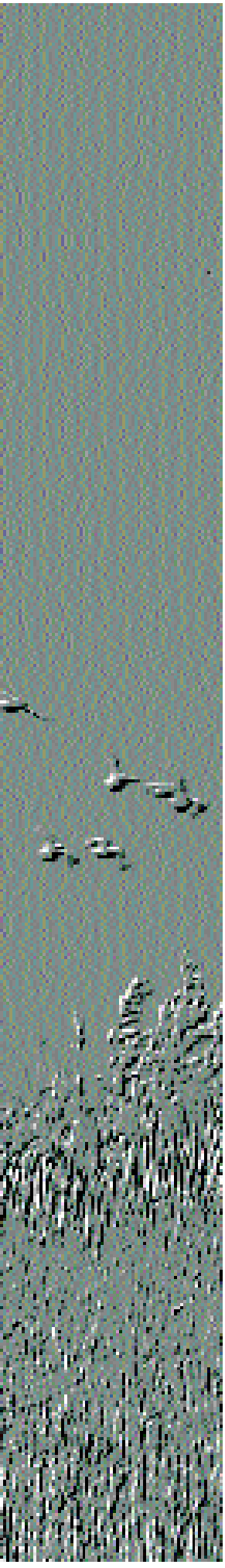
In the early 1990's, the entire flow of the Wash was diverted by construction of Lake Las Vegas (Figure 1.3). Wash flows were re-routed under the Lake through two large pipelines (i.e., conduits). Although this temporarily stopped channel erosion in the Wash along a reach of about two miles, subsequent flood flows intruded the clear-water lake, and severe erosion of the lower Wash continued upstream from Lake Las Vegas (Glancy, 1999).

By 1990, wastewater flows in the Wash had increased to approximately 93 mgd (145 cfs), the Valley's population had grown to approximately 708,000 people (CCDCP, 1994) and urban coverage in the Valley had increased to approximately 124,000 acres. Additionally, in 1991, the City of Las Vegas Water Pollution Control Facility expanded its capacity to 66 mgd.

Figure 1.3 - Photo of Lake Las Vegas, 1998 (Southern Nevada Water Authority).

1991-1993 – Clark County Begins Planning for Wetlands Park

In 1991, Nevada residents approved a wildlife and parks bond (Question 5) ear-marking $13.3 million for erosion control and construction of a Wetlands Park project in the Wash. Two years later, Clark County began work on a master planning process for the Wetlands Park. This process carefully examined current conditions in the Wash, solicited comments from the public about the desired future of the area and worked with various agencies to determine the type of uses to be accommodated.



1993 – Clark County Begins Planning for Pabco Road Erosion Control Structure

During work on the Master Plan document, Clark County began preliminary design analysis in 1993 for the first of several erosion control structures to be built in the Wash, the Pabco Road Erosion Control Structure (ECS). Its primary purpose was to control headcutting and erosion, and to protect wetlands in a one mile reach of the Wash between Pabco Road and Duck Creek (Kennedy/Jenks, 1993).

1994 – City of Henderson Water Reclamation Facility Built

The City of Henderson Water Reclamation Facility was built in 1994. Three methods of treated effluent disposal were instituted: discharge to rapid infiltration basins, discharge to the Wash and delivery to the City's extensive water reuse system (City of Henderson, 1999). Prior to this time, the City of Henderson discharged wastewater into rapid infiltration basins (not into the Wash).

1995 – Clark County Wetlands Park Master Plan Finalized

In July 1995, Clark County Parks & Recreation (CCP&R) finalized the Master Plan for the Clark County Wetlands Park. The document defined strategies for development of the Wetlands Park, including creating a system of trails, interpretive exhibits, a visitor center and picnic areas along the Wash, as well as construction of about 15 erosion control structures. Along with defining these project components, the Master Plan discussed how the plan should be implemented and managed by using a three-phased development approach. The Master Plan outlined what the major focus of each phase should be, along with estimated costs of development. The Wetlands Park was estimated to be complete by 2015 (Southwest, 1995).

By 1995, total acreage of wetland vegetation in the Wash had decreased considerably from what it was in 1985, while the amount of salt cedar continued to rise. This lessened the amount of suitable habitat for wildlife living in the Wash. In 1995, total acreage of wetland vegetation in the Wash (excluding salt cedar), from Desert Inn Road to Lake Las Vegas, was approximately 374 acres, which constituted a 70 percent reduction in wetland habitat for wildlife living in the Wash. The acreage of salt cedar had increased to 757 acres by this time (SNWA, 1999). See Appendix 1.1 for a more comprehensive look at vegetation in the Wash from 1975 to 1986.

1996 – Ownership Transfer of Grade Control Structure

On Jan. 1, 1996, ownership of all facilities, structures, pipelines and loans was transferred from the CRC to SNWA. This included the abandoned Las Vegas Lateral, the new lateral and the Grade Control Structure (DiTripani, 1999).

1996 – Friends of the Desert Wetlands Park Established

In March 1996, a non-profit organization called the Friends of the Desert Wetlands Park was officially established. The group formed for the purpose of organizing, developing and managing volunteer efforts to enhance the recreational uses, the natural, cultural and historical resources, and environmental maintenance of the Wetlands Park. Members currently work to strengthen and enhance opportunities for recreation use, interpretive understanding and appreciation of the Wetlands Park, and to protect and improve wildlife habitat (Bylaws, 1996).

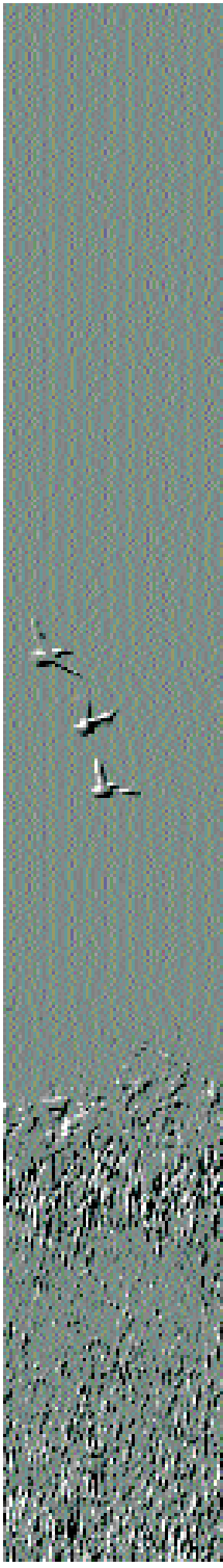
1997 – Dam Under Northshore Bridge Built and Failed

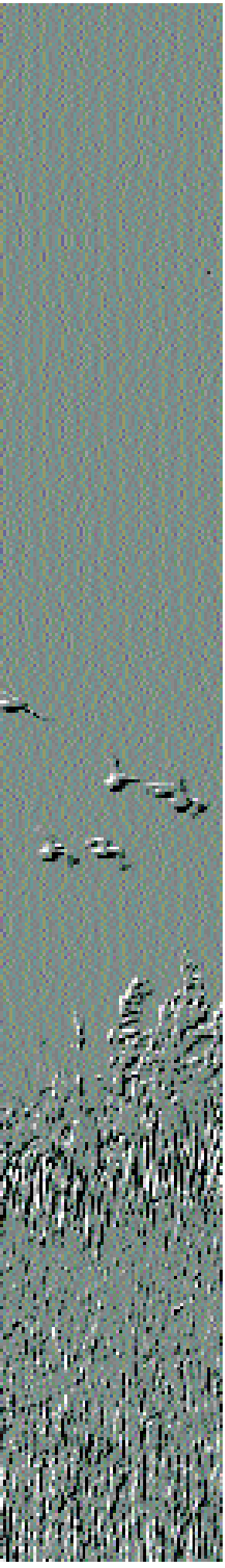
During its construction phase, Lake Las Vegas offered to build a concrete-lined channel under the Northshore Bridge to handle floodwaters. However, at that time, the National Park Service (NPS) was concerned that a concrete channel would cause a headcutting problem at the end of the channel. NPS engineers analyzed many options to protect the bridge and at the same time create wetlands habitat. The idea of wetlands being created attracted the U.S. Bureau of Reclamation (USBR), which offered to design and construct two dam structures. Rock was provided by Lake Las Vegas, and one dam structure was constructed in 1997. Within 24 hours, water eroded through the dam and it failed. Engineers concluded that the dirt-filled, rock dam was not strong enough to hold the Wash water and, since then, there have been no funds available to replace the structure (Burke, 1999).

In the following months, engineers re-directed the flow of water between the Northshore Bridge's pillars. However, flood waters from a September 1998 flood event further eroded adjacent banks and damaged bridge abutments. Erosion continues to be a problem for the bridge today (Burke, 1999).

1997 – Water Quality Forum and Citizens Advisory Committee Established

In response to growing concerns over water quality issues in the Wash and Lake Mead, the Nevada Division of Environmental Protection (NDEP) initiated the Lake Mead Water Quality Forum in 1997. The Forum was





comprised exclusively of local, state and federal agencies with an interest in environmental issues, water quality standards and identifying research needs.

Five months later, the Southern Nevada Water Authority (SNWA) established a 21-member Water Quality Citizens Advisory Committee to provide the Forum with public input and citizen recommendations. The citizens advisory committee was comprised of local citizens with an interest in water quality issues. Its mission was to develop specific recommendations to address and protect water quality in the Wash and Lake Mead.

In 1998, the citizens advisory committee developed nine recommendations that were presented to the SNWA Board of Directors and the Forum for approval and implementation. One conclusion was that, because water quality issues related to the Wash are complex, they are not the responsibility of any one public entity. Thus, the committee suggested that an interagency and community-wide effort be developed and implemented in order to address the many issues surrounding the Wash. They also recommended that the effort be coordinated through the SNWA. The Lake Mead Water Quality Forum agreed, and this was the origin of the Las Vegas Wash Coordination Committee.

1998 – Las Vegas Wash Coordination Committee Established

In October 1998, the SNWA developed and implemented the 28-member Las Vegas Wash Coordination Committee, comprised of local, state and federal agencies, members of the public, business people and representatives of environmental groups. The committee was charged with researching and analyzing issues related to the Wash and developing a comprehensive adaptive management plan that recommends solutions the problems.

By 1998, total acreage of wetland vegetation (excluding salt cedar) in the Wash, from Desert Inn Road to Lake Las Vegas, was approximately 304 acres, a 79 percent decrease in wildlife habitat from what existed in 1975. The acreage of salt cedar in the Wash had increased to 1,021 acres by this time (SNWA, 1999), and appears to be the result of salt cedar's ability to quickly establish itself in areas that have been eroded or scoured. See Appendix 1.1 for a more comprehensive look at vegetation in the Wash from 1975 to 1986.

1998-1999 – Three Major Flood Events

Three flood events, in July 1998 (Figure 1.4), September 1998 and July 1999 amplified channel erosion, advanced headcutting, removed second-growth salt cedar vegetation that replaced earlier wetland flora, destroyed the temporary GCS and intruded Lake Las Vegas (Glancy, 1999). The

Figure 1.4 - Photo of July 1999 flood flow in Wash near Northshore Road (Southern Nevada Water Authority).

September 1998 flood event alone caused 1 foot of vertical headcutting at Pabco Road, a surprisingly low amount (Hester, 1999); however, the channel was widened significantly and the temporary GCS was lost.

The temporary GCS, as originally built, was designed to last two years. It was not designed withstand a 100-year flood event and, during the three-year period from 1995-1998, suffered repeated damage by flood waters. Temporary repairs to the structure were made during this time by Lake Las Vegas.

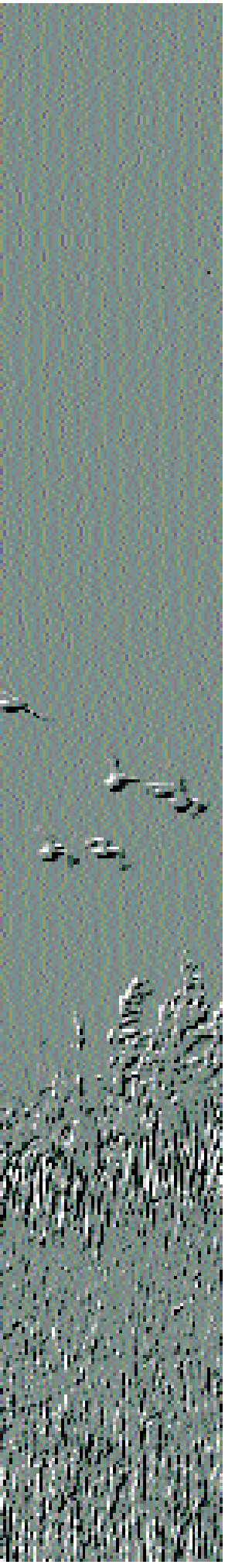
1998 – Emergency Repairs to Temporary Grade Control Structure

In July 1998, a cooperative agreement was signed between the SNWA and CCP&R to permanently repair the temporary GCS (Figure 1.5) in an effort to reduce erosion and enhance wetland vegetation in the Wash. However, in September 1998, before final design was completed for the permanent GCS, a flood event damaged the temporary GCS (Figure 1.6) and caused the need for the SNWA to conduct "emergency" repairs (before permanent repairs). Emergency repairs were completed in October 1998 (Figure 1.7).

Figure 1.5 - Photo of the Grade Control Structure before the September 1998 flood event (Pat A. Glancy, USGS).

1999 – Construction of Two Erosion Control Structures Delayed by Flood

In June 1999, final design was completed for the permanent GCS and the Pabco Road ECS. However, construction was delayed due to complications resulting from the most recent flood event, an intense summer storm that spread across the Valley on July 8, 1999. Sending more than 4.5 billion gallons of water through the Wash, the flood ripped into channel banks, washing everything down the channel,



including the temporary GCS. Erosion widened the channel at various locations in the Wash by an average of 300 feet, destroying some remaining wetlands and carrying tons of sediment into Lake Mead.

A month later, the SNWA and CCP&R initiated re-design of the permanent GCS and Pabco Road ECS, respectively. The flood event reinforced the urgency of constructing permanent grade control structures in the Wash. Both structures are expected to be complete in 2000.

Figure 1.6 - Photo of the Grade Control Structure after the September 1998 flood event (Southern Nevada Water Authority).

Late 1999 – Current Conditions

During 1999, the Wash exhibited peak flows (including stormwater) that exceeded the 100-year flood event estimated to be 12,700 cfs , while non-stormwater flows in 1997 were approximately 150 mgd (230 cfs). The Valley's population had increased to approximately 1.3 million people by 1999 (CCDCP, 1999), with urban coverage at approximately 187,000 acres (SNWA, 1999). Although these changes have affected the Wash dramatically by increasing erosion, the quality of wastewater discharged from treatment plants along the Wash has greatly improved since the 1970s. As a result, the quality of the water in the Wash today is probably better than it has ever been.

Figure 1.7 - Photo of the Grade Control Structure after October 1998 emergency repairs were conducted (Southern Nevada Water Authority).

In order to accommodate continued population growth in the Valley and increasing wastewater flows in the Wash, erosion and headcutting advancement must be controlled to protect wetlands, wildlife habitat, Wetlands Park facilities and adjacent developments.

Appendix

1.1 Las Vegas Wash Vegetation Study, May 1987

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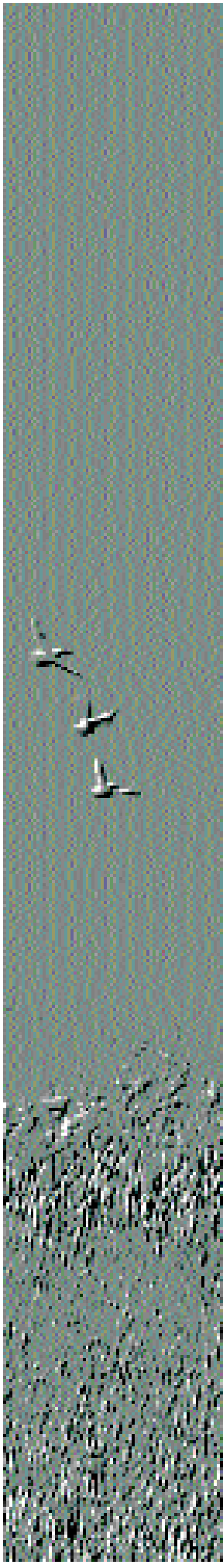

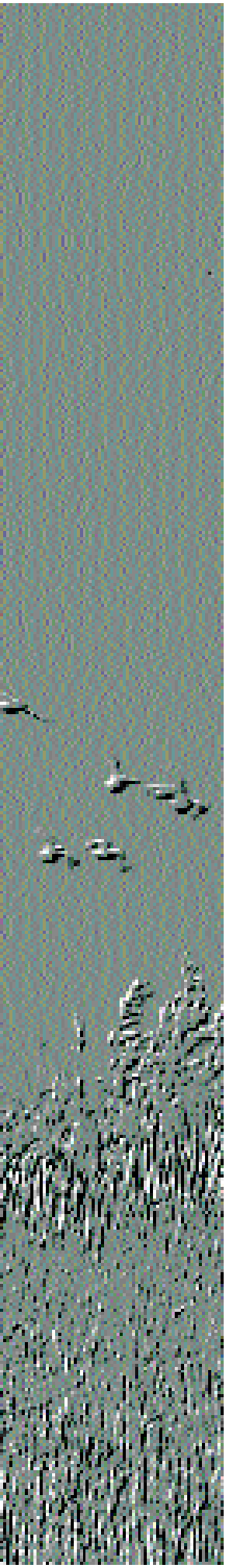

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