Everglades Construction Project Lessons Learned

Design
- Consideration for existing vegetation
- Maintain existing drainage
- Reduce existing drainage short circuiting
- No planting in large acreage
- Ample seepage return capacity

Construction
- Borrow material from outside of cell
- Level cells and water control structures
- Hydrate cells during construction
- Reduce short circuiting
- Startup – water movement flexibility

Operation
- Use hydrodynamic model for optimization
- Buffer maximum flow in SAV cells
- Hybrid cells - typical for large cells

Natural Treatment System Wetlands

Implications for Salton Sea Ecosystem Restoration Plan

- **Alternatives**
  dispersed wetlands - source treatment consolidated treatment wetland - 40,000 ac
- **Considerations**
  construction on soft soils - consolidation operational constraints - water
- **Performance**
  treatment optimization - flexibility in flow reduction of short circuiting - vegetation

Pilot Projects

Starting Points for Salton Sea Treatment Wetlands

- San Francisco Bay Estuary - Chevron Wetlands
- Tulare Lake Drainage District Wetlands
- New River Wetlands
- Oxnard Wetlands

San Francisco Bay Estuary - Chevron Wetlands

size:	90 acres
duration:	1992 - present
inflow rate:	4 cfs
resident time:	7 - 10 days

- Treatment of selenium - 89% reduction (20-30 ppb to <5 ppb)
- Preferred wetland constructed to reduce eco-risk to wading birds
- Planted wetland migrated to cattail marsh & open water
- Flow volume constant

Tulare Lake Drainage District Wetlands

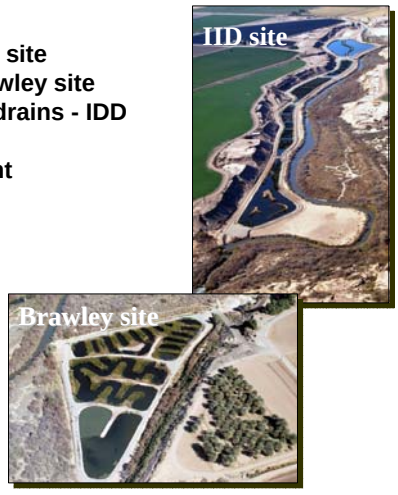
size:	**10 cells – 0.3 acres/cell**
source water:	**Agricultural drains**
duration:	**May 1997 - Dec 1999**
inflow rate:	**varied**
resident time:	**7 - 22 days**

- **69.2% selenium removal**
- **Each cell vegetation varied**
- **Agriculture drain water treatment before evaporation pond**

New River Wetlands

size:	**68 acres - IID site**
size:	**7 acres - Brawley site**
source water:	**Agricultural drains - IDD**
source water:	**New River**
duration:	**2000 - present**
inflow rate:	**1 cfs**
resident time:	**2 - 9 days**

- **Selenium data now being evaluated**
- **Sustainable wetlands**



Oxnard Wetlands

size:	**12 tanks**
source water:	**membrane concentrate WTP**
duration:	**June 2003 to present**
inflow rate:	**25 - 75 gpd**
resident time:	**20 - 72 days**

- **Mesocosm research using under drainage wetland flow**
- **Reduction in selenium from 22 ppb to 5 ppb**

Treatment Challenges

- **Selenium removal**
- **Water quantity & timing**
- **Vegetation density**
- **Operational flexibility**
- **Eco-risk reduction**
- **Multiple water quality issues (nutrients, salinity, selenium)**

Natural Treatment System (NTS)Wetlands

- Wetlands are consumptive water users
  - droughts in Everglades
  - Salton Sea is in a desert
  - compete with urban and agricultural users
- Selenium removal in treatment wetlands is a new technology
- May not be able to reach the ultimate goal in the first phase
  - Everglades Total Phosphorus reduction - inflow 120 ppb
  - Phase 1 target 50 ppb
  - Phase 2 target 10 ppb
- Vegetation changes
  - salt marsh at inflow cell
  - freshwater marsh at outflow cell

Everglades	Parameter	Salton Sea
52”/yr.	rainfall	4”/yr.
4 ppt	salinity	44 ppt
0 ppb	selenium	1-10 ppb
fresh	wetland	salt to fresh
0 - 2’/mi.	topography	0 - 40’/mi.
1.9 MM ac-ft	inflow vol	0.9 MM ac-ft
41,000 ac	wetland size	40,000 ac
10 - 50 ppb	phosphorus	50 ppb
not limiting	nitrogen	reduction to treat Se

Everglades	Salton Sea
Total Phosphorus	Selenium
Similar	Dissimilar
Contained in bio-floc	Eco-risk in birds & fish
Uptake by wetland plants	Volatized by plant
Digested by plankton and algae	Bioaccumulated
Sequestered in the sediment	Limited wetland experience
Settled in quiesent ponds	Salinity accumulation
associated w/ agriculture runoff	multiple water quality issues