



Compensatory Wetlands Mitigation Providing Community Benefits: Sunrise Valley Nature Park

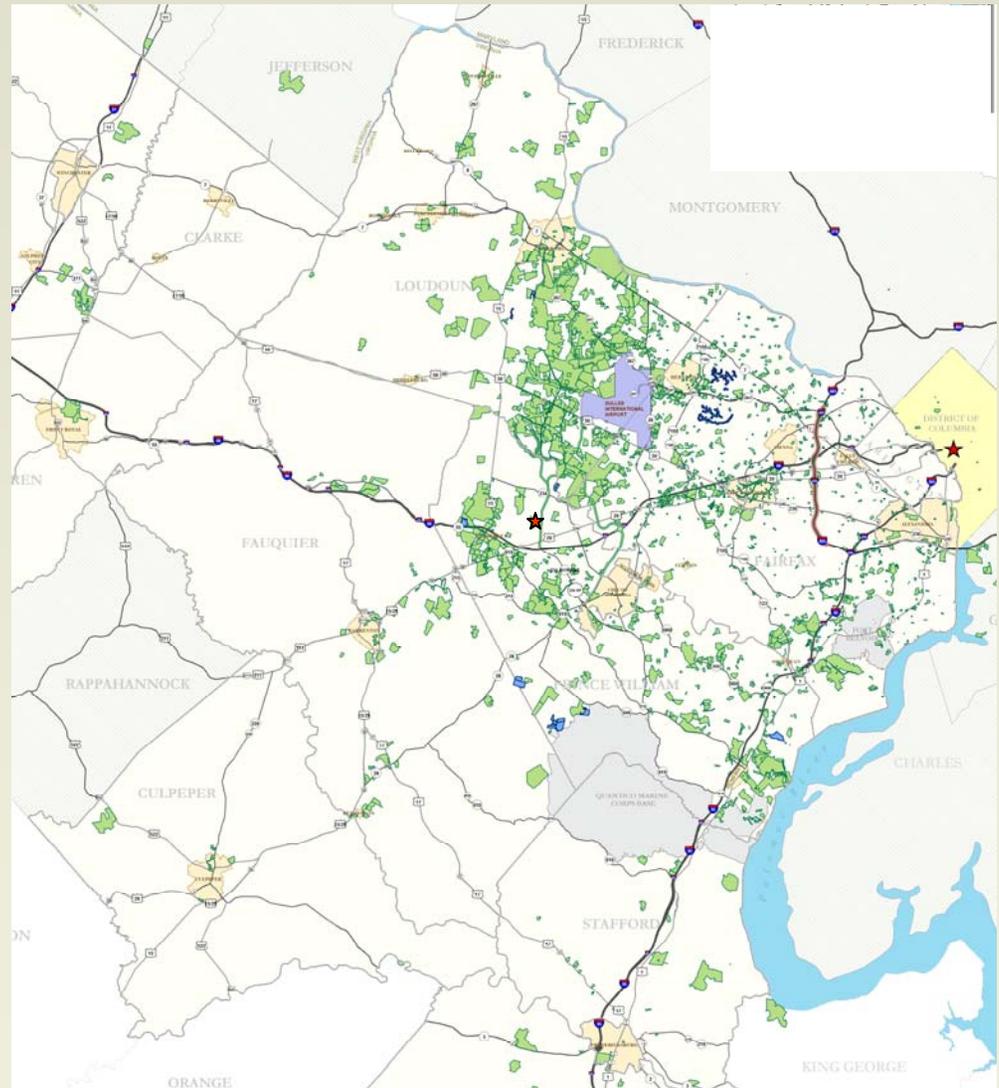
**Presented by Michael S. Rolband,
P.E., P.W.S, P.W.D., LEED®AP**

Wetland Studies and Solutions, Inc.
5300 Wellington Branch Drive, Suite 100, Gainesville, Virginia 20155
www.wetlandstudies.com



Wetland Studies and Solutions, Inc.

- **Natural and Cultural Resource consulting firm to developers and public works**
- **100 Staff**
 - **Archeology, Engineering, Environmental Science, Environmental Technology, GIS, Regulatory, and Surveying**
- **Over 2,500 sites covering 120,000 acres since 1991**



An Introduction

This is a case study of Sunrise Valley Nature Park (SVNP), a compensatory mitigation project in Reston, Virginia, created to satisfy requirements of a Clean Water Act Section 404 Permit issued by the U.S. Army Corps of Engineers in 1993 for development activities that are expected to end between 2010 and 2015.

SVNP successfully compensated for wetland and stream impacts while providing the community with education and passive recreation opportunities.

Participants

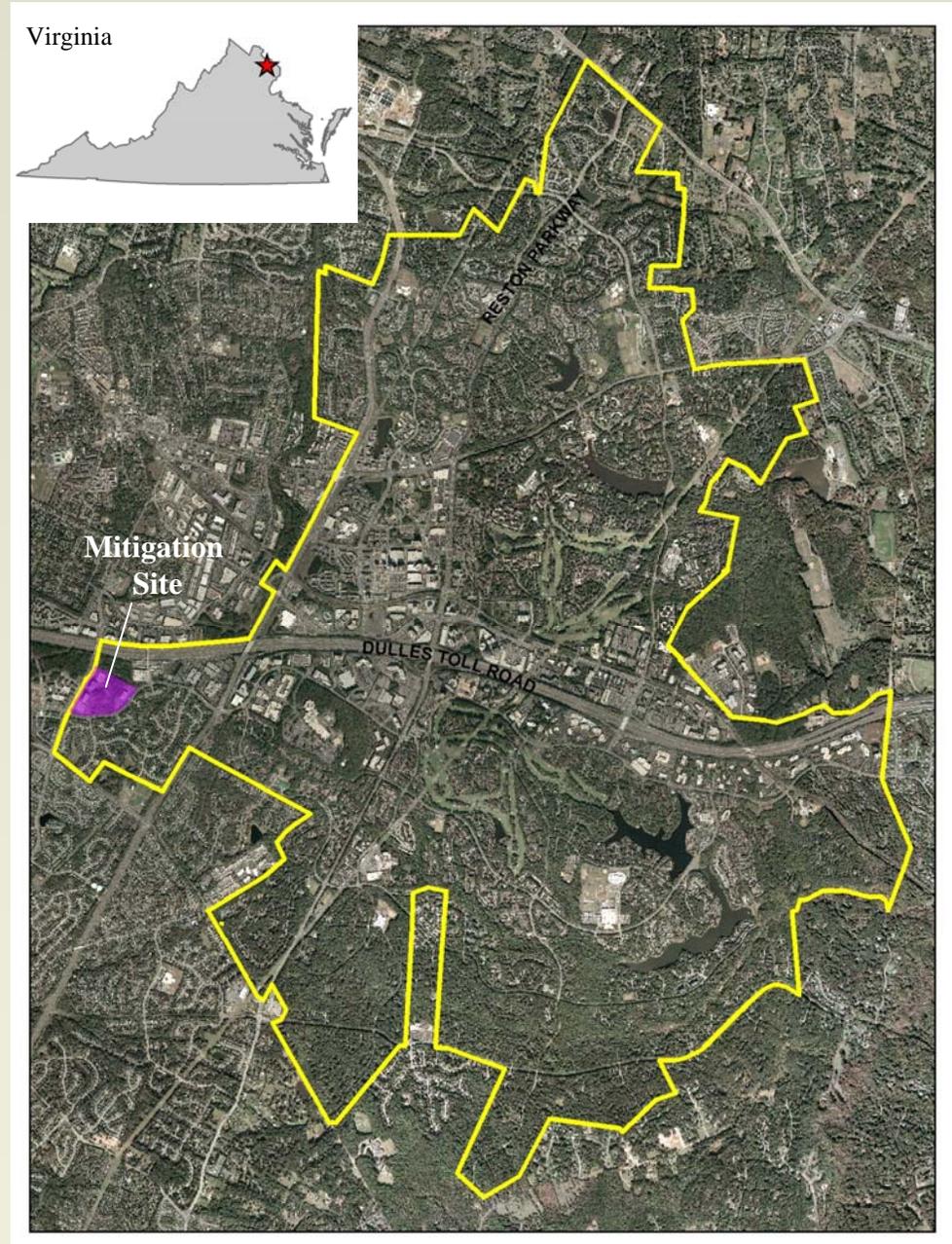


- **Developer:**
Reston Land Corporation, a subsidiary of Mobil
- **Consultant:**
Wetland Studies and Solutions, Inc.
- **Proposed Steward:**
*Reston Association,
the homeowners' association for this
60,000-member community*



The Location

Reston, Fairfax County,
Virginia



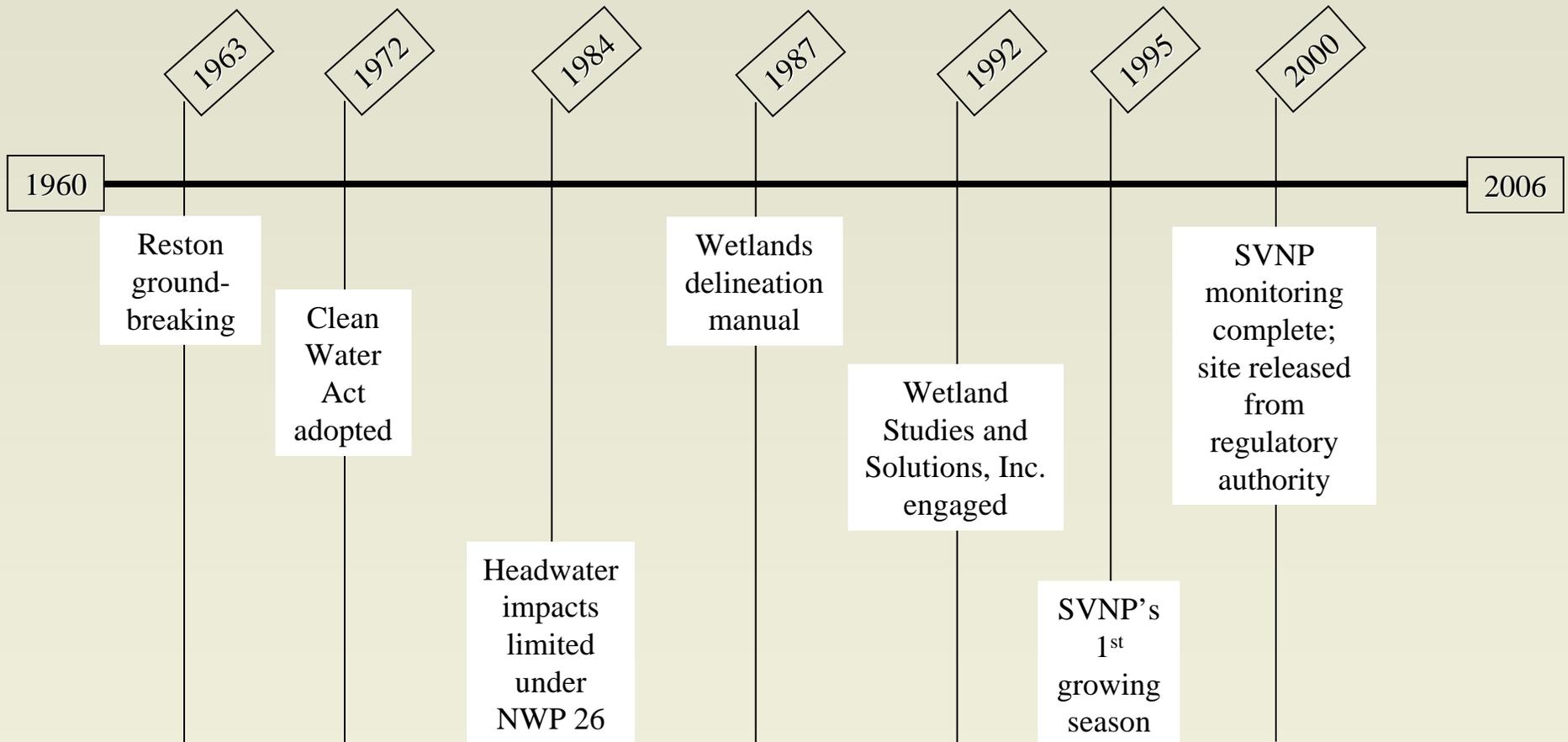
Sunrise Valley Nature Park



- Designed and permitted in 1993
- Construction began in July 1994



Reston and Regulations



Reston and Regulations

- 1963: Broke ground at Reston



Reston and Regulations



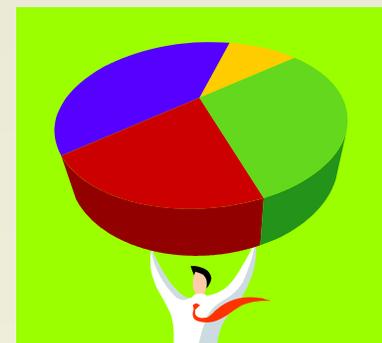
- 1972: Congress adopted Clean Water Act
 - unlimited impacts to headwaters
- 1984: Head water impacts limited under NWP 26
 - notify U.S. Army Corps of Engineers (COE) of impacts to ≥ 1 acre of headwater wetlands and streams
 - Individual Permit necessary for impacts > 10 acres



Reston and Regulations



- 1987: COE first issued current wetland delineation manual
- 1992: “Single and Complete” becomes an issue



Single and Complete Project



“...means the total project proposed or accomplished by one owner/developer or partnership or other association of owners/developers. For example, if construction of a residential development affects several different areas of a headwater or isolated water, or several different headwaters or isolated waters, the cumulative total of all filled areas should be the basis for deciding whether or not the project will be covered by an NWP [Nationwide Permit].”

33CFR330.2(i)



Single and Complete Project

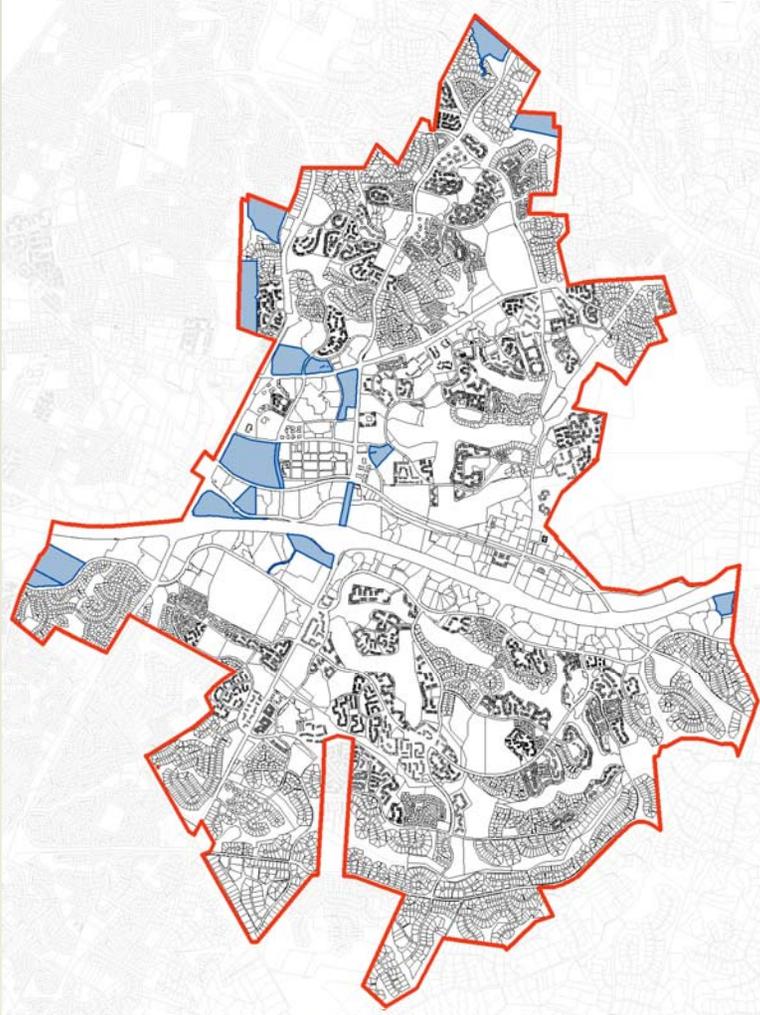


How could this affect the development of Reston?

- COE could determine if all impacts to wetlands and streams should be covered under one permit or under separate permits



Single and Complete Project



How could this affect the development of Reston?

- Reston was made of many small sections
- Historically the COE treated each section of Reston as a separate project
- Project zoned by locality as one project; marketed and operated as one project.

Single and Complete Project



How could this affect the development of Reston?

- Each individual section did not exceed the 1 acre impact threshold for mitigation, but if treated as one project the cumulative impacts required compensation.



Reston and Regulations



- 1992: Developer hires Wetland Studies and Solutions, Inc.



Developer's Directive

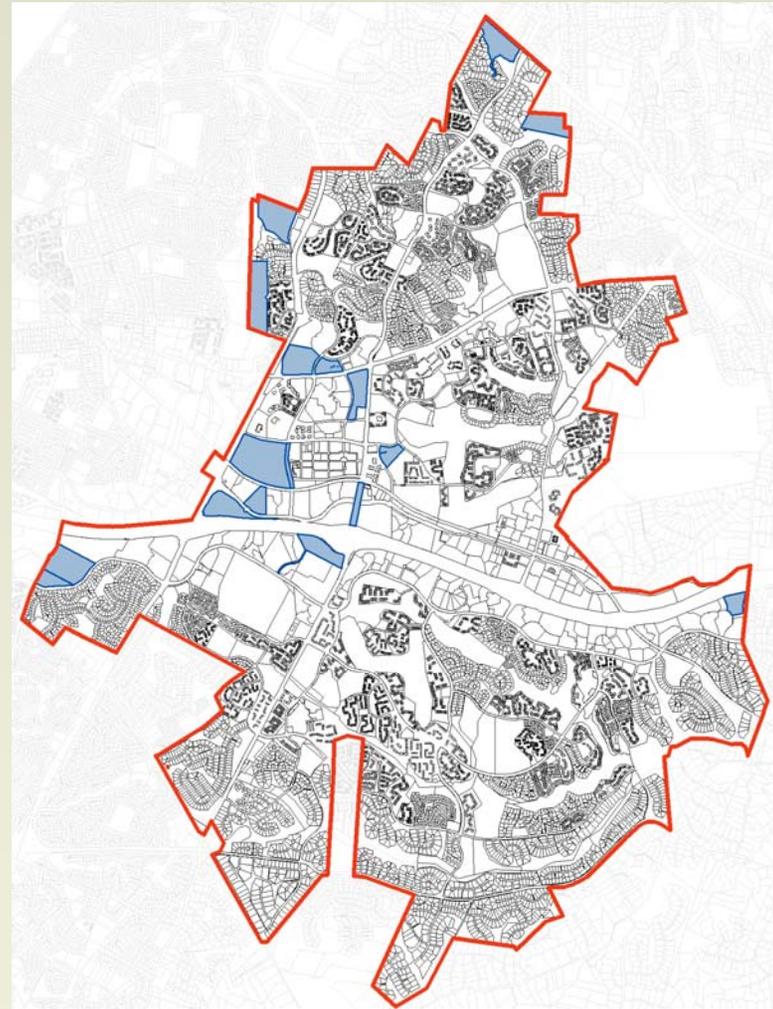


- Shoot for a gold medal
- Provide the best possible mitigation project incorporating community values
- Treat all remaining parcels as one project
- EPA objected to proposed bank solution; therefore call it on-site mitigation



Mitigation at Reston

- **Three step process:**
 1. **Avoid impacts**
 2. **Reduce impacts**
 3. **Compensate for impacts**
- **Analyzed 17 undeveloped parcels remaining within Reston individually to avoid and minimize impacts**



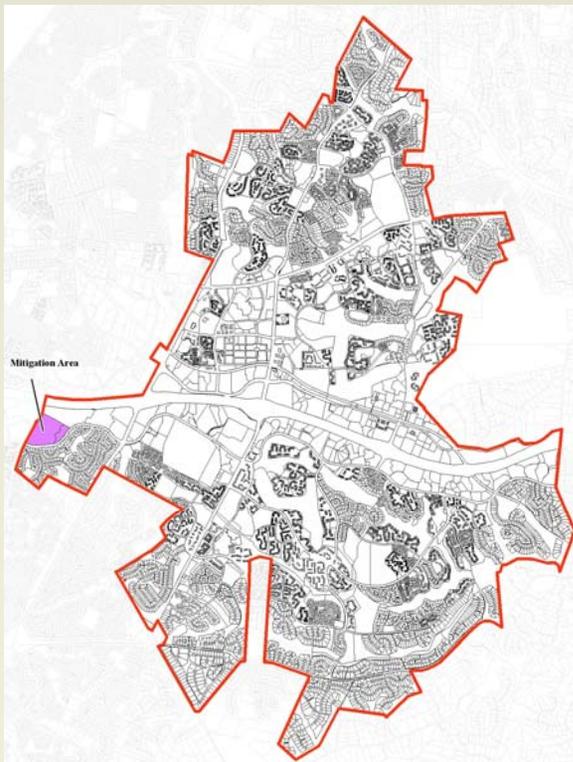
Mitigation at Reston

- Compensation for all impacts was combined at Sunrise Valley Nature Park
- At the time, stream and wetland impacts and compensation were lumped together
- Now, separate compensation for stream impacts would be required



Siting Criteria

- A *compensation site* is an area of land that is set aside for wetland and stream restoration. Compensation can be in the form of creation, restoration, enhancement, and/or preservation.



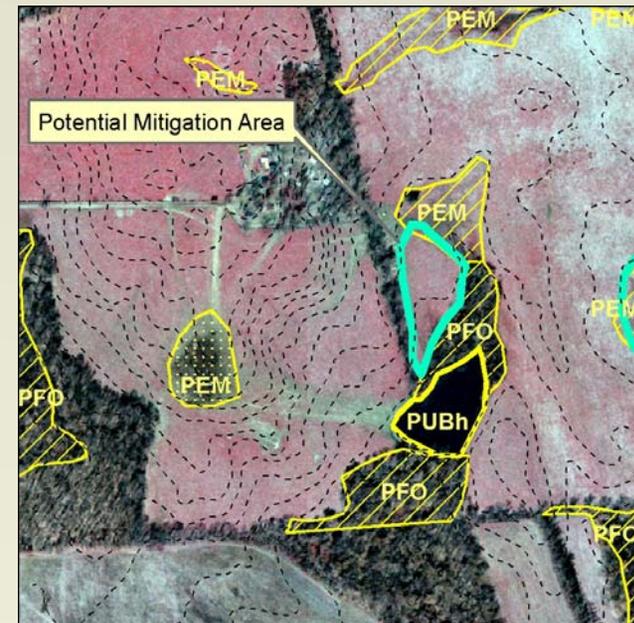
- Semantics....

*Is Reston's
compensation
on-site or off-
site?*



Siting Criteria

- A compensation site must have appropriate:
 - Soils (permeability)
 - Hydrology (water source, connectivity)
 - Topography (no steep slopes)
 - Vegetation (not forested)
- Site use must be Practicable
“Available and capable of being done after taking into consideration cost, existing technology, and logistics in light of the overall project purposes.”



40 CFR 230.3(q), Guidelines for Specifications of Disposal Sites for Dredged or Fill Material in 45 FR 85344, December 24, 1980, and as amended at 58 FR 45037, August 25, 1993



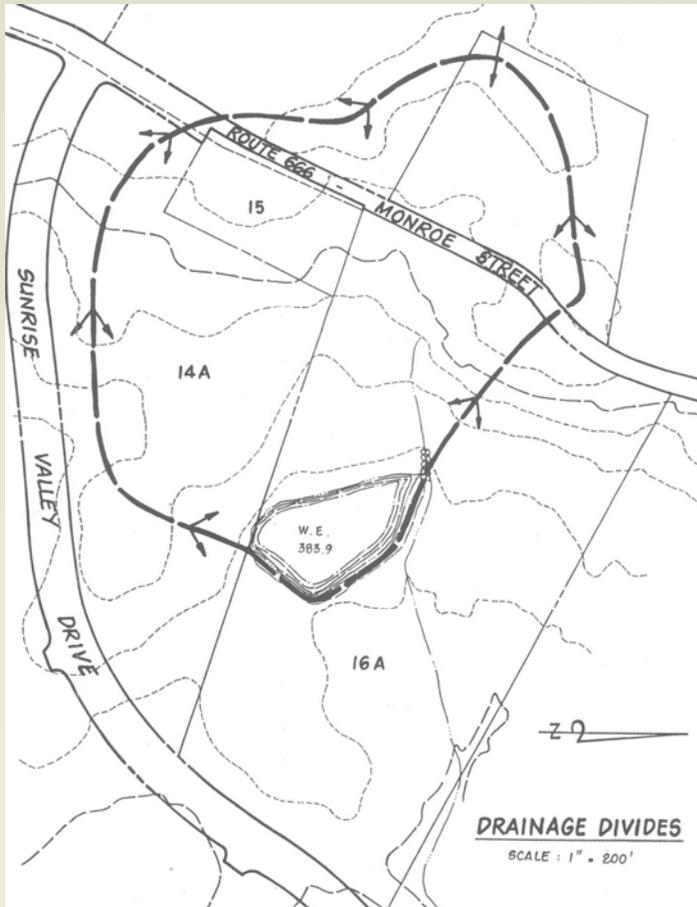
Alternative Sites



- Client wanted to use already-owned land due to cash-flow restraints during the early 1990's recession
- Site A
 - Would have required 10 – 15 feet of rock excavation
- Site B
 - Good soils and hydrology
 - Zoned for high density town center
- Site C
 - Low land value
 - Well-drained soils



Selected Site Issues



- **Water budget issues**
 - Pre-Development Curve Number: 73
 - Post-Development Curve Number: 92
 - Pre-Development flow volume insufficient to support wetland hydrology
 - Based on in-situ soil permeability testing
 - No development schedule for post-development conditions
- **Solution: Clay liner**



Selected Site Issues

- **Adjacent Land Use**
 - 1994
 - 2005
- **Impact on SVNP**



Design Solutions



- **Pond Outfall**
 - Post-development flow rate for design
- **Claymax®**
 - Bentonite liner system allows pre-development runoff volume to support wetlands hydrology



SVNP Design



- Upland forest
 - Preserved or reforested buffer: 6.50 ac
 - Constructed island: 0.30 ac
- Forested wetland
 - Preserved: 4.30 ac
 - Constructed: 1.65 ac
- Scrub-shrub wetland
 - Constructed: 0.90 ac
- Emergent marsh
 - Constructed: 0.70 ac
- Open water/floating aquatic vegetation
 - Existing pond: 1.20 ac
- Upland embankment dam
 - Re-constructed: 0.20 ac
- Butterfly garden
 - Covers several vegetation zones

15.75 acres total



Design Solutions



- Upland buffers and islands
 - maximize edge habitat
 - buffer habitat from adjacent land uses
- Educational components
 - 0.9 mile trail
 - 200' trex boardwalk
 - 5 interpretive stations



Construction: Soils

- Mined “good soil” for road bed impact site



Construction: Soils



- Hydric soils from impact site provided half of needed soils for SVNP
- After 5 years of monitoring, no significant difference between upland and hydric soil community diversity
- Using only hydric soils in mitigation site construction is not cost-effective!



Construction: Dam Innovation



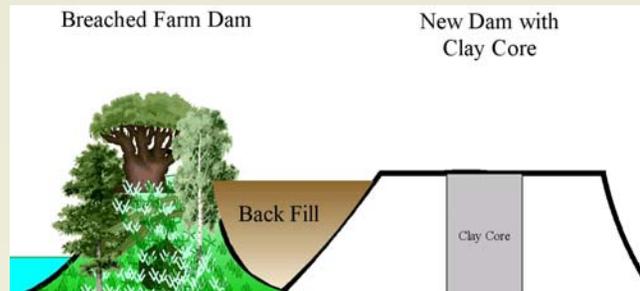
- **Problem: existing breached farm pond dam**

- With woody vegetation valued for wildlife
- Woody vegetation compromises dam integrity

- **Solution: new dam with clay core**

- Built behind existing dam
- Allows vegetation to remain in place
- Provides needed stability

- **Result: all parties satisfied**



Construction: Planting Strategy



- **Mix of balled and burlapped, container, seedling and seeds**
- **Higher cost, but better aesthetics and rapidly increased ecological value**



Planting Options



- Planting and seeding – how much?
- Different schools of thought
 - Erosion & Sediment control seed mix only
 - Let nature do it
 - Diverse wetland seed mix and bare root planting
 - Give nature a head start
 - Wetland seed mix, bare root, container grown, and B&B trees
 - Develop a diverse young forest with different age classes

Estimated Costs for Planting Options	E & S ONLY	WETLAND SEED MIX & BARE ROOT	DIVERSE PLANTING
E&S Seeding	\$1,500	---	---
Wetlands Seed Mix	---	\$3,000	\$3,000
Seedlings @ 6 O.C.	---	\$1,600	\$1,600
1 Gal. Shrubs @ 8' O.C.	---	---	\$6,150
3 gal. Trees @ 12' O.C.	---	---	\$5,150
1.5" dbh trees @ 40' O.C.	---	---	\$4,100
Total (cost/acre)	\$1,500	\$4,600	\$20,000

amounts in 2002 dollars



Erosion & Sediment Control Seed Mix



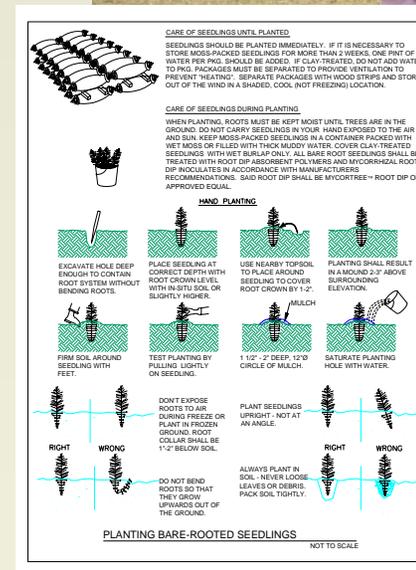
- Seed list comprised of 1-2 grass species
- Temporary erosion control prior to volunteer colonization
- \$1,500/acre



Diverse Wetland Seed Mix & Bare Root



- Seed mix is comprised of 26 herbaceous and 8 woody species
- Bare roots used to jump start re-forestation
- \$4,600/acre



Diverse Planting



- Wetland seed mix, bare root, container grown, and B&B trees
- Develop a diverse young forest with different age classes
- \$20,000/acre



Installation



1st Year



7th Year



Tree Tube Usage

- Survival rate vs. cost
- Flooding knockdowns
- Biodegrading
- Spindly trees vs. stout



Monitoring and Maintenance



- Invasive species
 - Purple Loosestrife
 - Cattails



Monitoring and Maintenance

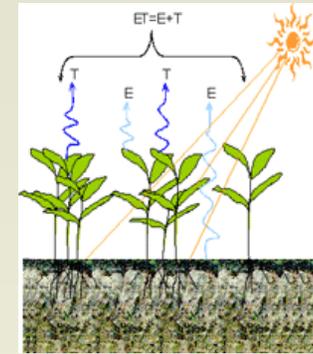
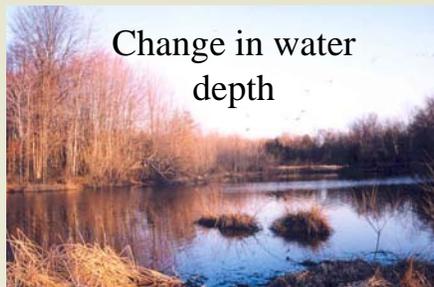


- **Water budget study**
 - Funded by Disney
 - Monitoring rainfall, surface flow input; infiltration; outflow; evaporation
 - To support this and other mitigation projects

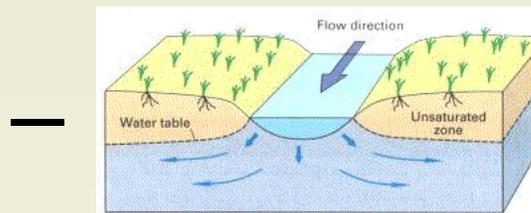


Water Budget Model

$$\Delta S = P + RO - ET - GWO - SWO$$



evapotranspiration



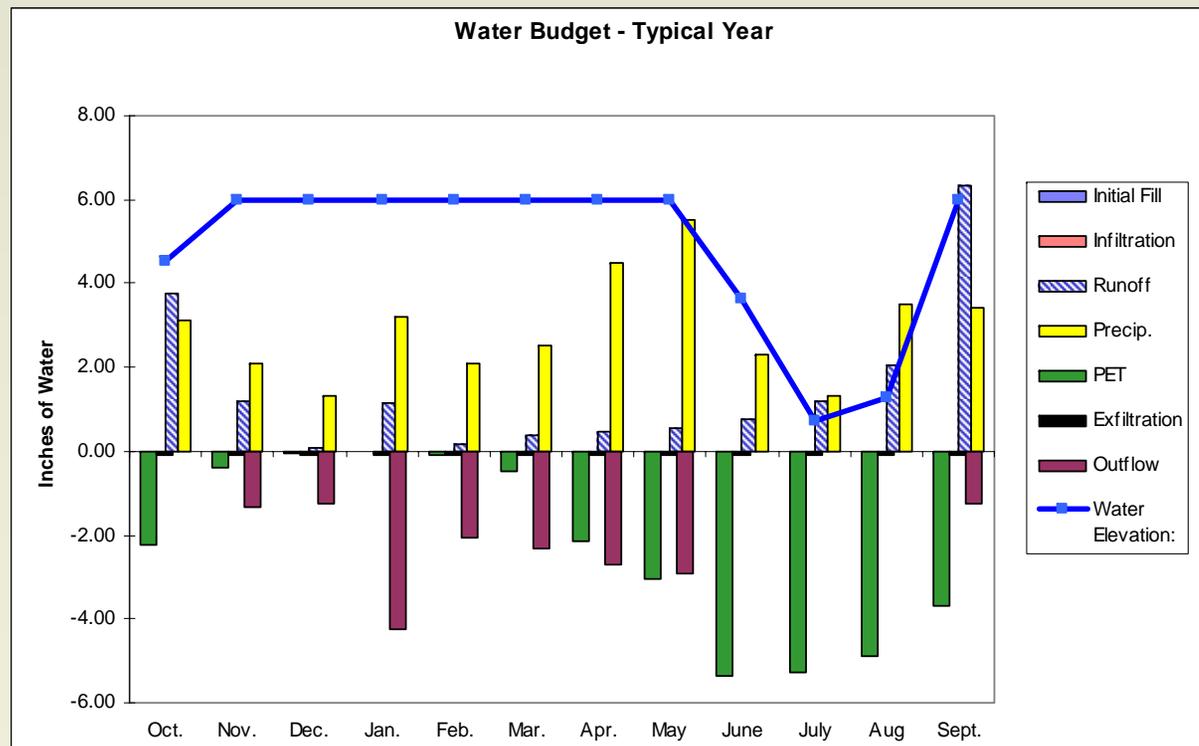
groundwater & surface water outflows



Water Budget Model



Example of a water budget



Water Budget Model



SVNP water budget model components and water level prediction

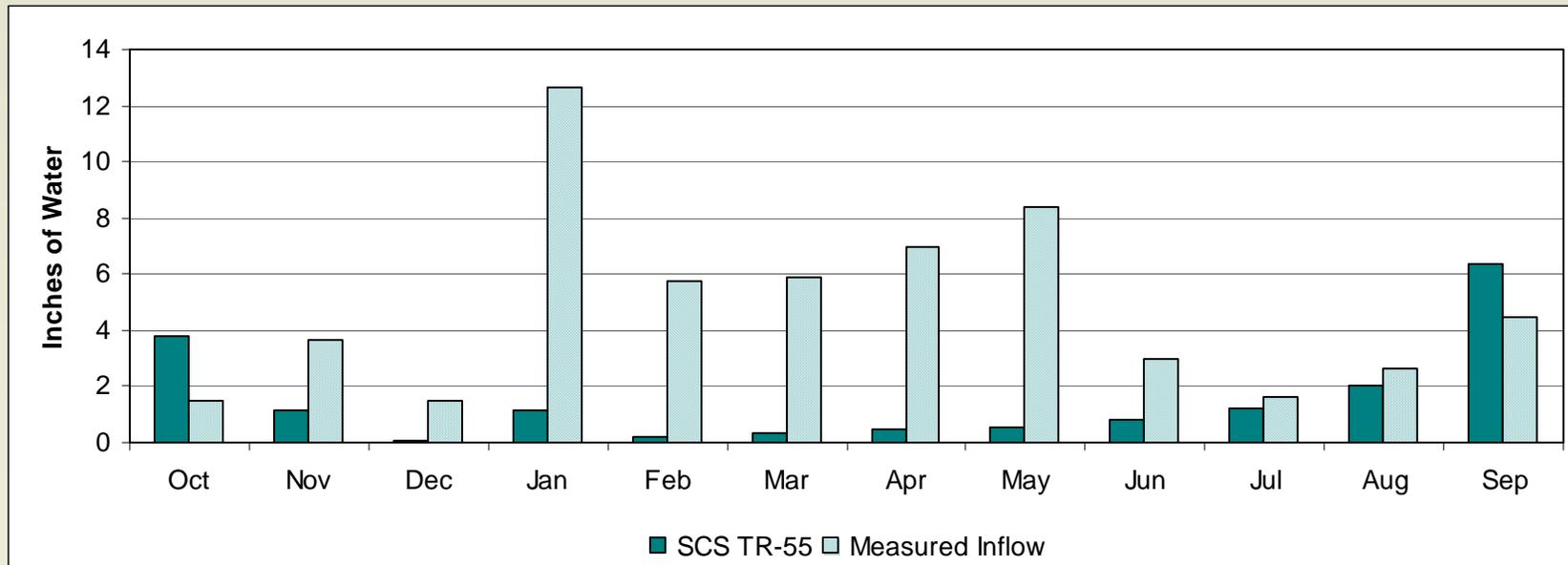
Water budget model components and water level prediction for pond/wetland system.													
1995/96	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug	Sept.	Year
INPUT:													
Initial Fill	2.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.28
Infiltration	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Runoff	3.79	1.18	0.06	1.16	0.17	0.37	0.47	0.57	0.79	1.21	2.05	6.35	18.18
Precipitation	6.51	4.75	2.05	5.61	2.62	3.52	3.69	7.07	4.88	5.89	4.16	7.73	58.48
OUTPUT:													
PET	-2.23	-0.39	-0.03	0.00	-0.10	-0.46	-2.16	-3.06	-5.36	-5.28	-4.90	-3.67	-27.65
Exfiltration	-0.10	-0.10	-0.10	-0.10	-0.10	-0.10	-0.10	-0.10	-0.10	-0.10	-0.10	-0.10	-1.22
Outflow	-0.38	-5.44	-1.98	-6.66	-2.59	-3.33	-1.90	-4.48	-0.20	-1.71	-1.20	-10.28	-40.13
Water Level *	9.85	9.85	9.85	9.85	9.85	9.85	9.85	9.85	9.85	9.85	9.85	9.85	
* expressed in depth (inches) over baseline elevation which is approximately the average distance from weir invert to average elevation of soil substrate in wetland.													



Water Budget Model



SVNP comparison - surface water runoff



The Payoff



Long-Term Stewardship Problems



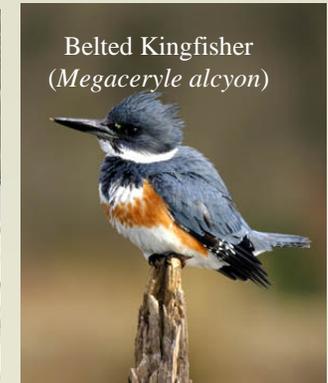
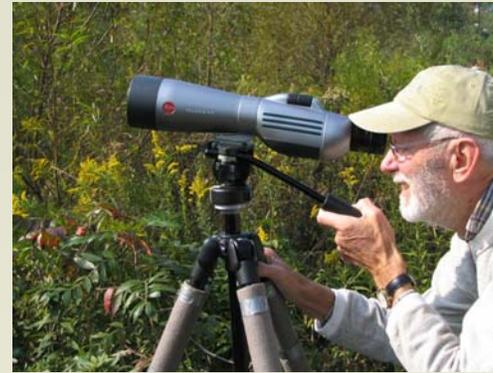
- **SVNP** was promised to Reston Association – it has not yet been transferred.
- **What happened? Owners and People Change**
 - Reston Land Corporation (1961)
 - Gulf Oil Corporation (1967)
 - Mobil Oil Corporation (1978)
 - Terrabrook (1996)
 - Trammell Crow (2000)
 - MassLife & Homeland Security (2005)



Community Impact



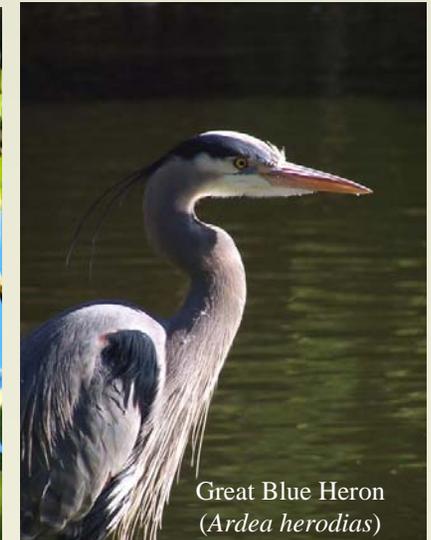
- Annual bird counts:
 - Winter
 - Breeding/Summer
- Approximately 120 species, including:
 - Wood duck, American kestrel, Philadelphia vireo, Orchard oriole, American woodcock, Belted kingfisher, Red-necked grebe, Great blue heron
- More than 30 species nesting



Belted Kingfisher
(*Megaceryle alcyon*)



Orchard Oriole
(*Icterus spurius*)



Great Blue Heron
(*Ardea herodias*)



Community Impact

- Annual butterfly count
- Annual dragonfly/damselfly count



Eastern Tiger Swallowtail
(*Papilio glaucus*)



Monarch
(*Danaus plexippus*)



Harlequin Darner
(*Gomphaeschna furcillata*)



Swamp Spreadwing
(*Lestes vigilax*)



Sparkling Jewelwing
(*Calopteryx dimidiata*)



Community Impact



- Annual school trips
- Reston Association classes, including
 - Birding 101
 - Senior lifelong learning classes
- Eagle Scout projects



Community Impact



- Federal funding in 2005 for wildlife hedgerow planting to maintain natural landscape border with Homeland Security



10 years after it began,
SVNP is still a community centerpiece



Questions?

