

7,200 sq. ft. tennis court behind da Vinci Arts Middle School



Students testing their design ideas at full scale

Pictures
Grant #923607
Urban Water Works



Grading after concrete removal



Digging the pond edges



Hard at work



The garden ready for planting

Pictures
Grant #923607
Urban Water Works



Pictures
Grant #923607
Urban Water Works



The finished garden!



**daVinci Arts Middle School
Water Garden Project**

**Phase Two
2002-2003**

**A joint project of
Urban Water Works and
daVinci Arts Middle School**

Submitted by Erin Middleton
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7/30/03

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Project Description

This project is Phase Two of a multi-year program created by Keepers of the Waters and Da Vinci Arts Middle School. Phase One, begun in September 2000, was partially funded by the US Fish and Wildlife Service and Metro by the Environmental Education, and the Salmonid Enhancement grants. It consisted of a yearlong cross-disciplinary curriculum at Da Vinci Arts Middle School, coordinated by Keepers of the Waters. Over 120 students in various classes learned about stormwater mitigation, urban watershed and water pollution issues, ecological processes related to watershed health, rainwater harvesting, water garden design, natural stormwater treatment methods and urban wildlife habitat restoration. The culmination of Phase One was a design charette in June 2001, attended by students, parents and local design professionals.

Phase Two, which ran from September 2001 to June 2003, covered the conceptual design process and the actual construction of what came to be known as the Da Vinci Water Garden. The students and parents participated in an after school program led by science teacher Dan Evans and assisted by other da Vinci teachers. Interested students, parents and community members met throughout the school year to plan and design the 7,200 sq. foot rainwater harvesting garden. In addition, a team of landscape designers, artists, hydrologists, engineers and parents were available to provide technical support for the students.

The garden broke ground in June of 2002. During the summer of 2002 Dan Evans and a dedicated team of students met every Wednesday, to build the pond, the stream, the amphitheatre and the other planted areas. Weekend volunteer work parties were held for major events like moving boulders, building paths, preparing the soil for planting. Planting took place during the Fall of 2002 through a combination of student work teams, and additional weekend work parties for parents and community. A final celebration took place on Earth Day 2003, with students acting as guides to explain the water harvesting features of the garden to over 2,000 visitors to the site. There was a dedication ceremony to honor the hard work of all who had participated, with speeches given by students, faculty, Urban Water Works, city Commissioner Saltzman, and Metro Councilman Burkholder.

The purpose of the Da Vinci Water Garden is to showcase innovative urban methods for harvesting rainwater, and simple stormwater remediation methods. The garden combines artistic elements with sustainable stormwater mitigation practices, complimenting Metro's and Bureau of Environmental Services' plans for reducing the inner east Portland storm water drainage.

GOALS AND BENEFITS

The goals of the Da Vinci Living Water Garden are to:

- Redirect and retain runoff from approximately 15,000 square feet of roof and parking lot surface.
- Return 7,200 sq. ft. of paved surface to permeable land.
- Create a living laboratory for ongoing science research by students.
- Introduce native vegetation where there currently is none.
- Provide supportive habitat for wildlife and insects.
- Use art to educate and inform about natural water treatment in vibrant and inspiring ways.
- Demonstrate innovative "backyard" solutions for rainwater harvesting and reuse to the surrounding community.
- Provide a unique opportunity for Da Vinci students and community to create a natural space for their enjoyment.

The Benefits so far:

- Ducks have taken up residence.
- Fish and frogs in pond are making a mosquito unfriendly habitat
- Students ask to spend their recess and lunches in the garden
- Teachers are using the garden space as resource to create art projects, and enhance classroom learning
- Science classes have begun documenting insects and birds that are moving in.
- Neighbors and dog-walkers are helping water and weed the garden. They are taking ownership, and active stewardship of the space, and learning about ways to reuse their own roof runoff.
- Amphitheatre has been used by school to stage performances.
- The garden has become a destination for educational tours given by Metro, the Office of Sustainable Development and Bureau of Environmental Services, and is included in the traveling BES slideshow of innovative stormwater remediation solutions.
- The Earth Day Celebration at Da Vinci became an opportunity to educate thousands of citizens, inspiring many to take up rainwater harvesting, disconnect their downspouts, use more native plants in their yards, and believe that volunteer community projects can make a big difference in our city.
- 200,000 + gallons of water per year, will not be entering the inner east side storm drains.
- 600+ students in the past three years have been involved in some aspect of creating this garden. Each year 100+ new students get to learn about it, study it, enjoy it, and add their ideas to it.

Timeline of school Activities

School year 2001/2002

Science teacher Dan Evans leads an after school club for interested students.

Fall/Winter

Landscape designer Martha Kroener, Niki Todd, and other visiting parent volunteers work with students to develop final design ideas for living water garden.

January-March 2001

Steve Murray and Dave Whitaker teach students how to shoot grade and determine percolation rate of soil to. Field trip to the Ole Ersson's home to see model rainwater harvesting system and cistern setup.

Steve Murray, Dean Apostol, begin developing finished drawings and grading plans to begin permitting process

April 2002

Students take garden plan and paint it on tennis court to work out spatial relationships, and to begin to visualize, and advertise their garden.

May 2002

Landscape Architect Gretchen Vadnais and parent volunteer Niki Todd, an avid gardener, work with students to choose appropriate native plants for different areas of garden.

June 2002

Belgrade Excavating removes rebar imbedded concrete from site. Grading is done to rough out contours of the garden.

Summer 2002

UWW is awarded a grant from the Bureau of Environmental Services' Willamette Stormwater Control Pilot Program, and the Office of Sustainable Development's G-Rated Grant.

Dan Evans, assisted by project contractor Neal Aronowitz of Urban Water Works, leads summer work parties. Dan and a group of students meet every Wednesday to smooth out the mechanical grading, loosen soil, and create the pond.

Saturday work parties of students, parents, teachers and community members are held to install the pond liner, cut the paths, form the stream bed, lay rock and gravel, prepare soil for planting. Cisterns are installed. With support from Hughes Water Gardens, the pond is sculpted, lined, and filled with gravel.

Fall 2002

Hannah Jacobsen, Americorps intern begins working for UWW to support project teacher at school.

Topsoil is brought in and plants from Echo Valley Natives are delivered; planting continues all Fall.

Contractor is hired to reroute downspouts to cisterns.

Downspouts are disconnected from storm drains, and rerouted to cisterns and pond.

Students build dry stone amphitheatre area with guidance from natural builder Sukita Crimmel and Americorps intern Hannah Jacobsen.

Andrew Butterfield's classes design and build beautiful batik banners that fly above the garden!

Marry Morris's and Katie Rorrer's classes make fused glass ornaments to decorate the chain link fence around garden.

Winter/Spring 2003

Dan Evans and student document a large storm event. The water garden works perfectly. While the surrounding streets are flooded with water, the garden calmly fills with water. Hannah Jacobsen and students continue to plant, and mulch garden. An after-school garden club creates plant id signs, and a book documenting plants in the garden.

April 2003

Bridges get built.

Community celebration of garden takes place as part of Earth Day Celebration held at da Vinci Arts Middle School.

2002/2003 Project Work Teams

After-school Student Garden Group

The team of 5-10 students met every Wednesday, from 3-4:30 pm during the 2001/2002 school year. They worked on many elements of the Garden's design. These included:

- Working with Martha Koerner, landscape architect, to determine placement and components of the garden
- Studying native plants
- Researching strawbale & cob construction for possible outdoor classroom/seating
- Participating in cob construction workshops & making cob
- Measuring rainfall off portable classroom roofs
- Measuring infiltration and percolation rates of the soils on the garden site
- Learning how to shoot grade, and surveying the garden area with a transit
- Building a scale model of the garden
- Participating in DaVinci Garden outreach booth at various community events
- Field-trips to student-created gardens at Madison High School and Environmental Middle School
- Documenting technical information about the garden.
- Laying out full-scale garden design on the tennis court to test their ideas
- Preparing the site for construction by clearing weeds, rocks, etc.
- Assisting in the placement of the Rainwater Cisterns
- Designing the gazebo/shelter components

Adult Planning Group

The core adult planning group for the 2001-2002 school year consisted of Erin Middleton, Dan Evans, Neal Aronowitz, Rachel Stein, Ishi Buffam, Doug Ingamells, and Niki Todd. This group met every Wednesday from 4:30-6:00, to guide the design and construction process.

Their work included:

- Creating a water budget for the site
- Sizing the pond, bioswale, wetland and amphitheater
- Surveying the site for topographical data
- Documenting percolation rate of the soil
- Securing permits from Portland Public Schools and the City of Portland
- Obtaining information about the operation and pricing of rainwater cisterns
- Obtaining information about the operation and pricing of flowforms
- Obtaining information about the design and pricing of pond and necessary materials (liners, pumps, gravel, etc.)
- Investigating funding sources for construction of garden
- Coordinating professional services for design assistance
- Meeting with engineers and designers to create timelines, work plan, drawings, etc.
- Writing outreach articles and contacting partner organizations
- Researching native plants and where to obtain them
- Collaborating with artists to design specific artistic components of the garden
- Tabling at various community events
- Contacting volunteers and planning work parties

2002/2003 Project Work Teams

continued

Professional Design Services

The following individuals provided pro bono professional design and engineering services for the creation of the Water Garden:

- Steve Murray, KPFF Engineers- impervious surface/drainage calculations
- Dave Whitaker and Michael Soliwoda, CH2MHILL Engineers- water balance and budget for the garden, rooftops, pond, wetland
- Joseph Richards, Engineer-water balance, wetland design
- Martha Koerner, Landscape Architect-preliminary & final site design/led students in site design creation
- Dean Apostol, Landscape Architect- final site design and drawings
- Gretchen Vadnais, Landscape Architect- planting plan
- Todd Blossom, Gardener- planting plan
- Eva Luna, Natural Building Convergence- cob construction instruction
- Mark Mikalovitch, Architect- gutter design, bridge design, gazebo design, plumbing permits

Project Budget

Environmental Education Grant Project Budget				
Category	Grant	Matching Funds	Matching In-Kind	Total
Personnel				
Project Coordinator	\$2,960.00	\$3,482.50	\$1,600.00	\$8,042.50
Americorps Assistant	\$1,100.00	\$1,100.00	\$2,200.00	\$4,400.00
After-School Club Teacher and Construction Supervisor		\$3,500.00	\$2,200.00	\$5,700.00
Volunteer Planning group			\$600.00	\$600.00
Volunteer Labor				\$0.00
Students			\$6,825.00	\$6,825.00
Parents & community			\$4,784.00	\$4,784.00
Professional Support includes design and engineering support and 1 substitute teacher	\$443.35	\$1,404.00	\$12,320.00	\$14,167.35
Materials includes pond liner, rock, gravel for paths, cisterns, plumbing, plants, soil, mulch and more	\$142.00	\$22,267.47	\$9,435.80	\$31,845.27
Rentals includes concrete removal, excavation and grading		\$2,500.00	\$3,000.00	\$5,500.00
Indirect/other	\$10.94	\$108.18	\$700.00	\$819.12
TOTALS	4,656.29	34,362.15	43,664.80	\$82,683.24

Project Staff / Workers / Volunteers

Project Staff:

Dan Evans, Lead Teacher and Project Supervisor
Erin Middleton, Project Manager for Urban Water Works
Rachel Stein, Temporary Project Coordinator in 2002
Hannah Jacobson, Americorps Volunteer

Volunteers from the school community:

Tom Breuckman, Principal da Vinci Arts Middle School
Andrew Butterfield, Mary Morris, Shannon Wasson, Katie Rorrer, Bill Martin, Ana Quinn, and all the wonderful teachers at Da Vinci Arts Middle School
300+ students, 100+ parents and community members who built the garden during the summer and fall of 2002

Volunteers from the professional community:

Martha Koerner, Landscape Architect
Dean Apostol, Landscape Architect
Gretchen Vadnais, Landscape Architects, LLC
Mark Mikalovich, Architect
Steve Murray, Engineer, KPFF
Mike Soliwoda, Engineer, CH2MHILL
Dave Whitaker, Engineer, CH2MHILL
Scott Dethloff, Engineer, CH2MHILL
Joseph Richards, Wetlands Specialist
Anne Mavor, Graphic designer/photographer
Neal Aronowitz, Contractor, Aronowitz Tile and Stone
Judy Bluehorse Skelton, Native plants specialist
Ishi Buffam, Biologist
Niki Todd, Gardener
Todd Blossom, Gardener
Eva Luna, Cob builder
Ole Ersson, Rainwater harvesting expert
Pam Knowles, PR support
Kathy Budas, Media support
Kelley Webb, Urban Water Works board member
Kelly Rodgers, Urban Water Works board member

Paid Contractors:

Sukita Crimmel, Natural Builder
Dean Rosel Hunter, Downspout work

Project Staff / Workers / Volunteers

Businesses that provided materials at reduced rates:

Flowforms America
Hughes Water Gardens
Ramco Mechanical Construction
Belgarde Excavation & Construction
Echo Valley Natives
McFarlane's Bark, Inc.
Mt. Scott Fuel Co.
Rapid Grade Conveyor Trucks
Smith Rock
Coca-Cola
Parr Lumber

Friends of da Vinci Water Garden:

(Volunteers in charge of on-going maintenance and repair of the garden)

Pat Rumer
Rachael Ellsworth
Rick Morse
Roberta Lampert
Niki Todd
Ron Stanton
Rachel Wiecking
Maryann McCormick
Teresa Zahariades
Kristen Perry
Allen Field
Nona Wasson
Patricia Banchero
Brooke Staton
Gavril Piper
Bonnie hutchens
Tyler and Beth Bradford
Chris Stori
Dan Evans
Dori Jones
Erin Middleton

Alyson Osborn
Grayce Reed
Barbara Kits
Janice Dole
James Hill
Kerry Morgan
Kary Aloveah
Drew and Leena Faust
Larry Ferguson
Marguerite Scott
Ivan Sanders

What Worked / What Didn't / Helpful Hints

What worked:

Partnering with outside professionals
Developing an innovative project with teachers and students
Getting support from city departments
Using an invitational approach with teachers
Having an outside organization like Urban Water Works facilitate and support teachers from the inside. Being able to ask them "How can I help you make this happen at your school?" and then assisting them in finding professionals to create a project larger than their skill set.
Getting media coverage
Having the students lead the design, with adequate technical support
Using this project at the school to get citizens interested in, and informed about sustainable stormwater remediation solutions
Having a part time Americorps volunteer working for us at the school two days a week. She was our on-the-ground support for all of the planting and much of the building.

What Didn't

Limited control over what teachers actually took on, and when they got involved in the project.
Keeping the students interested in such a long project. And keeping them engaged with something other than busy work while we struggled with permits, and signatures...
Working within the limitations of a busy school calendar, with students who have sports and other activities every night of the week.
Finding an effective way to communicate with parents—even with articles in the school Newsletter—I never really knew if they were reading it!
Tracking exact hours of volunteers on long work days when people came and went at will.
Having someone available to document all the various stages, and activities throughout the school year.

Helpful Hints

Trust the process! There were many times when it seemed as if we wouldn't get to the next stage, or cross over certain hurdles, and then along would come the perfect person to help us get unstuck, and sometimes take the project to a whole new level.

TECHNICAL WATER INFORMATION & SOLAR

Table 2
DaVinci Middle School Wetlands
Water Balance (Wetlands only)

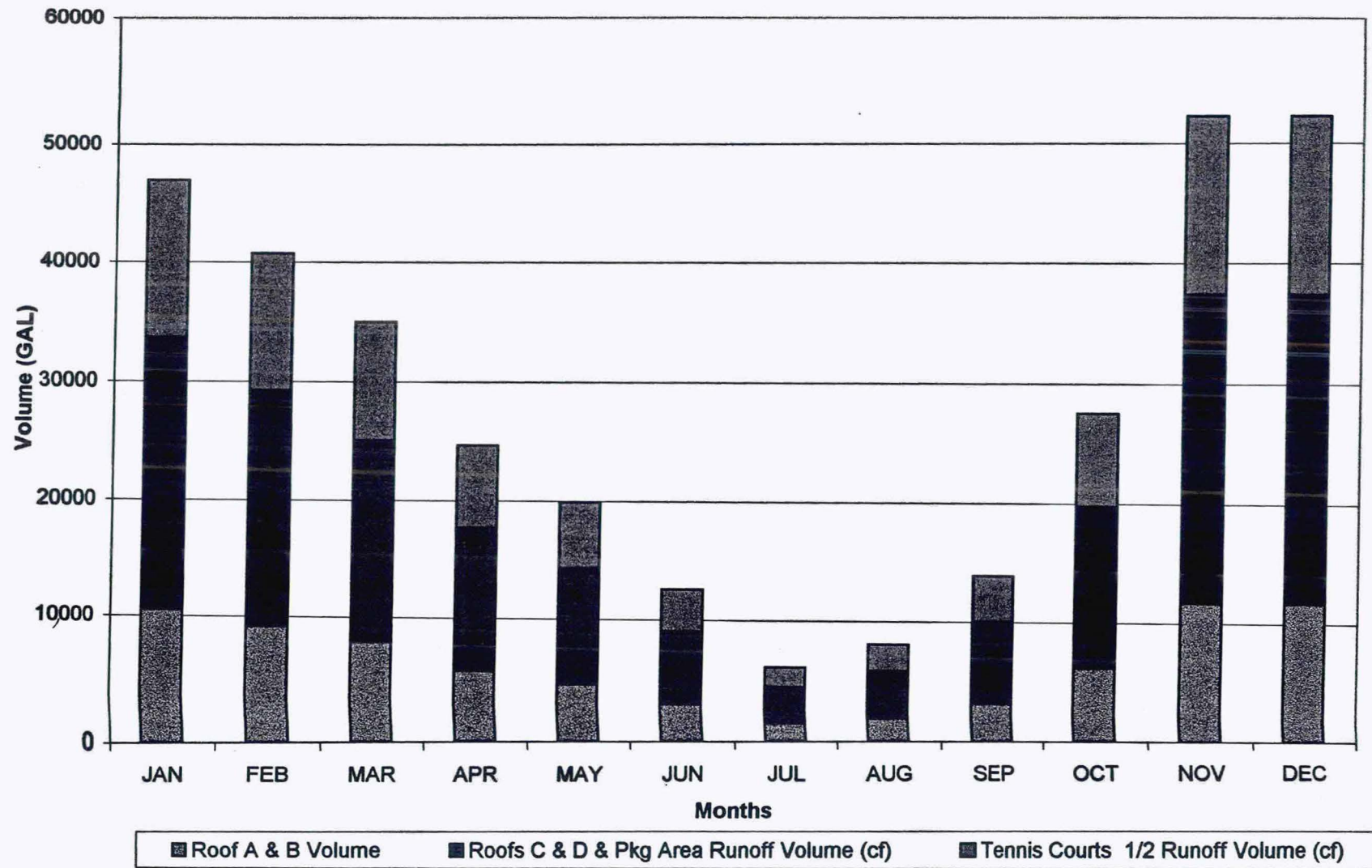
Month	Precipitation (inches)	Evapotranspiration (inches)	Inflows (acre-feet)				Outflows (acre-feet)			Monthly Balance (Inflows-Outflows) (cf)	Volume of Water in Wetlands(cf)	Outflow to Infiltration (cf)	Wetland Condition
			Outflow from Pond (cf)	Roof C & D and Parking Area (cf)	Total Monthly Precipitation on Wetlands (cf)	Total Inflows to the Wetlands (cf)	Total Monthly Evapotranspiration (cf)	Monthly Infiltration/ Soil Uptake (cf)	Total Monthly Outflow (cf)				
Jan	5.93	0.66	417	2618	494	3530	55	110	165	3365	750	2615	Ponded
Feb	5.16	1.15	411	2276	430	3117	96	192	288	2829	750	2079	Ponded
Mar	4.42	2.23	392	1950	368	2709	186	372	558	2152	750	1402	Ponded
Apr	3.13	3.37	436	1379	260	2075	281	562	843	1233	750	483	Ponded
May	2.52	5.17	424	1114	210	1748	431	862	1293	455	750	0	Ponded
Jun	1.58	6.04	513	699	132	1344	503	1007	1510	-166	584	0	Ponded
Jul	0.77	7.53	410	339	64	813	628	1255	1883	-1069	0	0	Dry
Aug	1.02	6.88	495	450	85	1030	573	1147	1720	-690	0	0	Dry
Sep	1.76	4.75	504	778	147	1430	396	792	1188	242	0	0	Wet
Oct	3.48	2.43	757	1537	290	2584	203	405	608	1977	750	1227	Ponded
Nov	6.59	1.08	362	2910	550	3822	90	180	270	3552	750	2802	Ponded
Dec	6.60	0.61	380	2911	550	3840	51	102	153	3689	750	2938	Ponded
Total	42.97	41.90	5501	18961	3581	28043	3492	6983	10475	17568		13545	

ASSUMPTIONS:

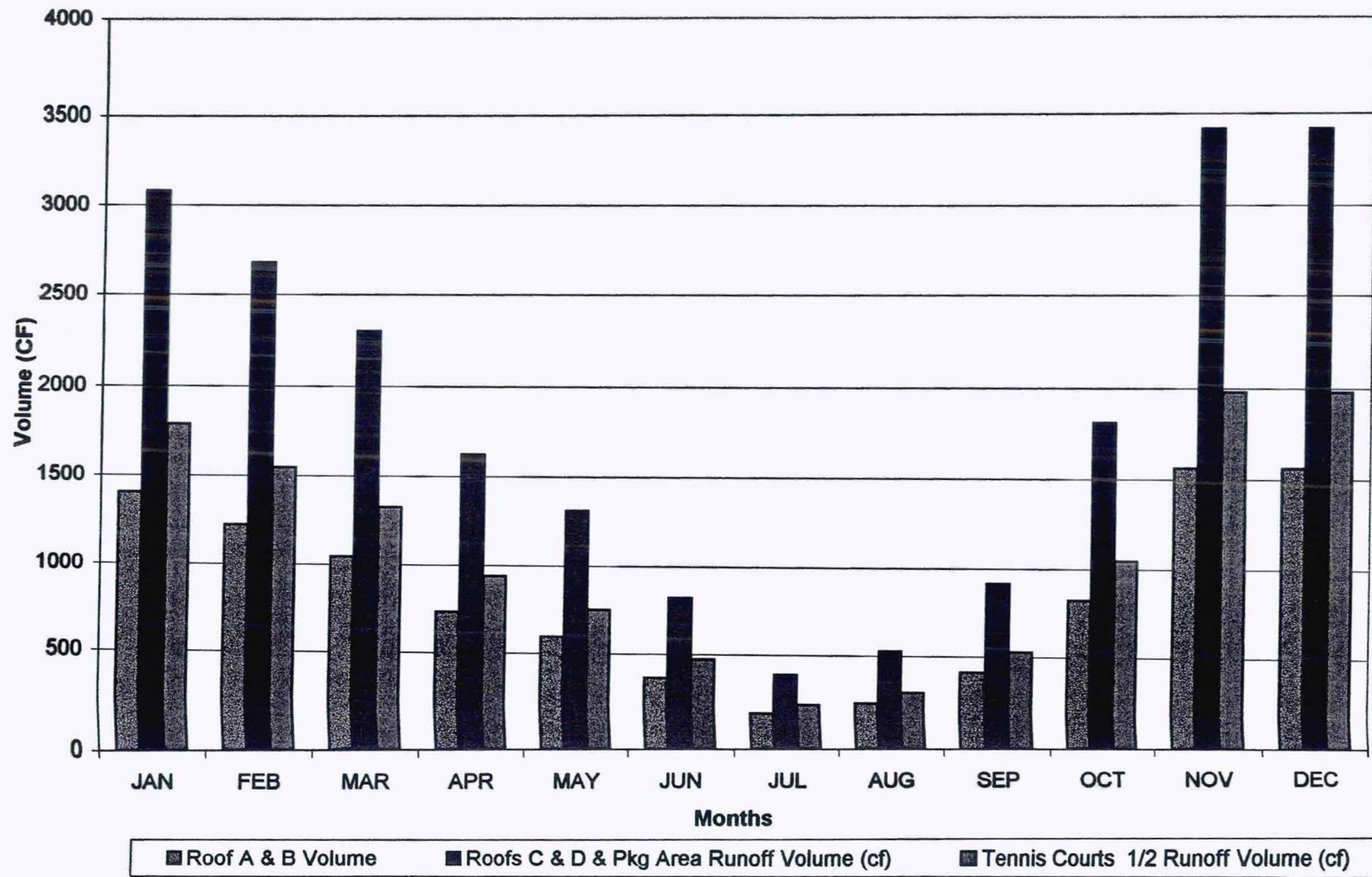
Roofs C & D & Pkg Area	6230 sq. ft.
Approximate Area of Wetlands	1000 sq. ft.
Ponded Volume of Water in Wetlands	750 cubic ft.

- 1) Evapotranspiration is equal to pan evaporation from the North Willamette Field Station
- 2) Assume 85% of rainfall runs off of contributing drainage area (Roof C&D and Parking Area)
- 3) Assume that wetland area is lined.
- 4) Assume that the soil above the liner and adjacent to the liner will absorb water at a rate that is equal to 2X the pan evaporation rate.

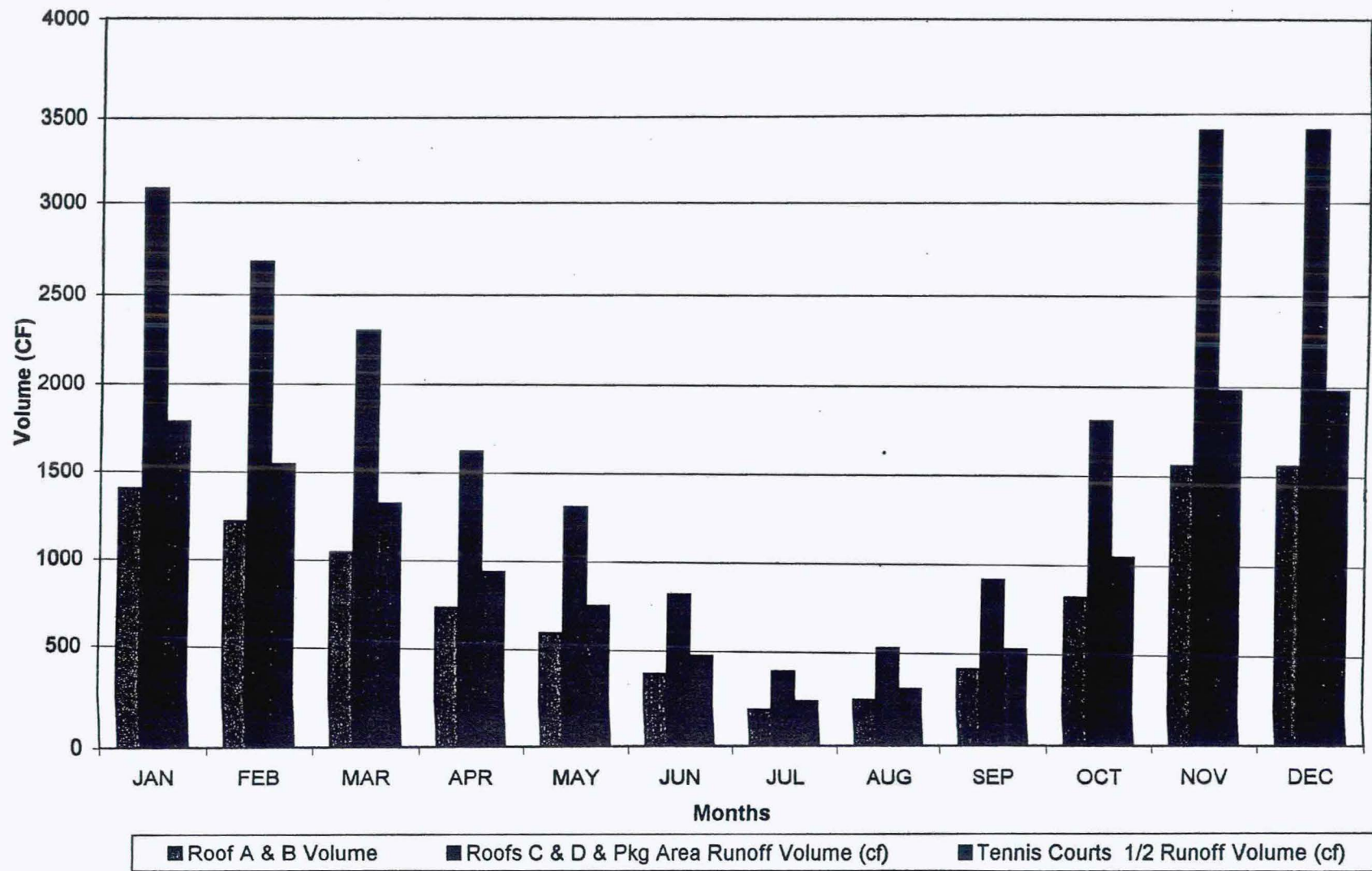
Precipitation Volume Available



Precipitation Volume Available



Precipitation Volume Available



Let's Make A Water Garden!

Mr. Evans'
Afterschool Club
Wed.'s 3-4:30 pm



Special Field Trip Dec. 12th!

Session 1

8 weeks

Oct. 17 - Dec. 12

Create final design
for living water garden
with
Landscape Architects

Sign up sheet located on Mr. Evans' door

Ideas for Living Water Garden by Da Vinci Students:

General:

Winter garden/Summer Garden

Winter — lots of things happening because of abundance of water — water wheel, fountains, ...

Summer — nothing happening but water supply to plants and pond

2 cisterns to hold water — one storage for summer

2 cisterns — one holds summer water for community garden

3 different taps coming out of cistern at 3 different heights — lowest level for plants, highest level for winter sculpture, middle tap to?

Paint layout on cement to help publicize project and get sense of scale

Have specific classes responsible for taking care of parts of the garden

Themes:

Dragon theme

Raindrop theme — symbol of Portland based on city logo

Broader theme based on spiral or circle to symbolize integrity and living up to your word

Negative/positive design with things counterbalancing each other — dry riverbed and pond...

A theme that brings together community

Creating community at the theme — create a garden that the action of experiencing garden creates the community idea.

Leonardo Da Vinci theme — what would that look like?

Elements:

Paddle wheel

Generator

Batteries

Solar

Lights along the sides of garden running on solar or water generated power that light the garden at night

Flowforms

Pond with newts and salamanders

Lots of water movement in winter

Meandering paths

Blind spots to expand space

Bridges over flowing water

Spaces near pond to watch wildlife

Changes in elevation to see landscape from different angles

Have paths spell out words

Plants with cultural significance

Native plants that can be harvested and used for crafts/eaten/rituals

Edible plants for animals and people

interpretive signs
places to sit
outdoor classroom

Break up Diverse Corridor
green house
tables / picnic
trees
living Machine

paths



How do you want people to use/interact with the space?:



Have space to perform



Places for students to display their art work



Keep space open for future art work made in future years



Covered places to sit down



Trellis with plants



Umbrellas on loan – to use thru garden in winter



Create a garden that makes you use all your senses:



Plants that smell good



Variety of texture in plants, paths, benches...



Colorful artwork and plants



Think about winter garden plants versus summer garden plants



Create different "rooms" within garden – maybe each space focuses on different them or idea.



Video station with ongoing images of work by students



"Gallery" space with changing exhibits of student work



plastic yurt with projected images on surface



Questions to think about:



How do we integrate the science and the art?



How do we explain to visitors all that the water is doing in our garden?



How can we do this thru design rather than signage?



What kind of field trip would be fun/helpful at this point? (Portland



Nursery? Native plant nursery? Visit a flow form that is sited in a garden?



Field trip to Crystal Springs?)



How should we split of the designing work?

