



U.S. Department of Energy  
Energy Efficiency and Renewable Energy

# Site Planning and Water Conservation

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# Site Planning





# Site Selection Criteria

- No harmful chemicals or toxics on or near the site.
- Good air quality near the site (e.g., no major pollution sources).
- Acoustics (quiet).
- Little impact on the environment (Preserve habitat and natural resources).
- Sites with existing buildings that can be retrofitted.
- Existing infrastructure (water, power, etc.).
- Close to the “customer”.
- Near public transportation.



# Site Plan Should Consider...

- Energy efficiency.
- Water efficiency.
- Material efficiency.
- Protection of the natural ecosystem.
- Acoustic, thermal, and visual comfort.
- Health and indoor air quality.
- Security and safety.
- Connection to neighborhood and community.
- Learning from nature.
- Space for playing.



# Site Planning Criteria

- Orientation and solar control
- Acoustics
- Protecting and using natural features
- Zoning of the site for community Access



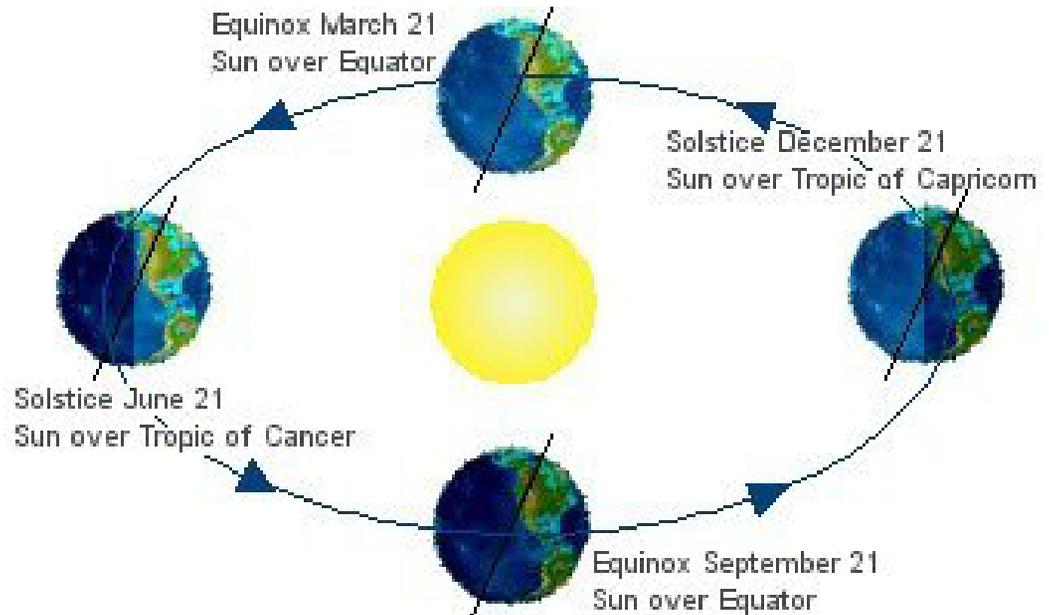


# What's so hard about orientation ????

- **Sun position** is utterly knowable, just like gravity.
- We don't design buildings ignoring the direction of gravity....

**SO...**

- Why would you ever design a building ignoring the direction of the sun???
- Think **TWICE** before you put in those windows facing **WEST!**





# Orientation Basics

- East-west orientation to maximize north-south daylighting.
- Width of building less than 60 feet for daylight and ventilation.
- Single story designs for toplighting daylight strategies.
- Use shade and airflows for summer cooling and winter heating/wind protection.



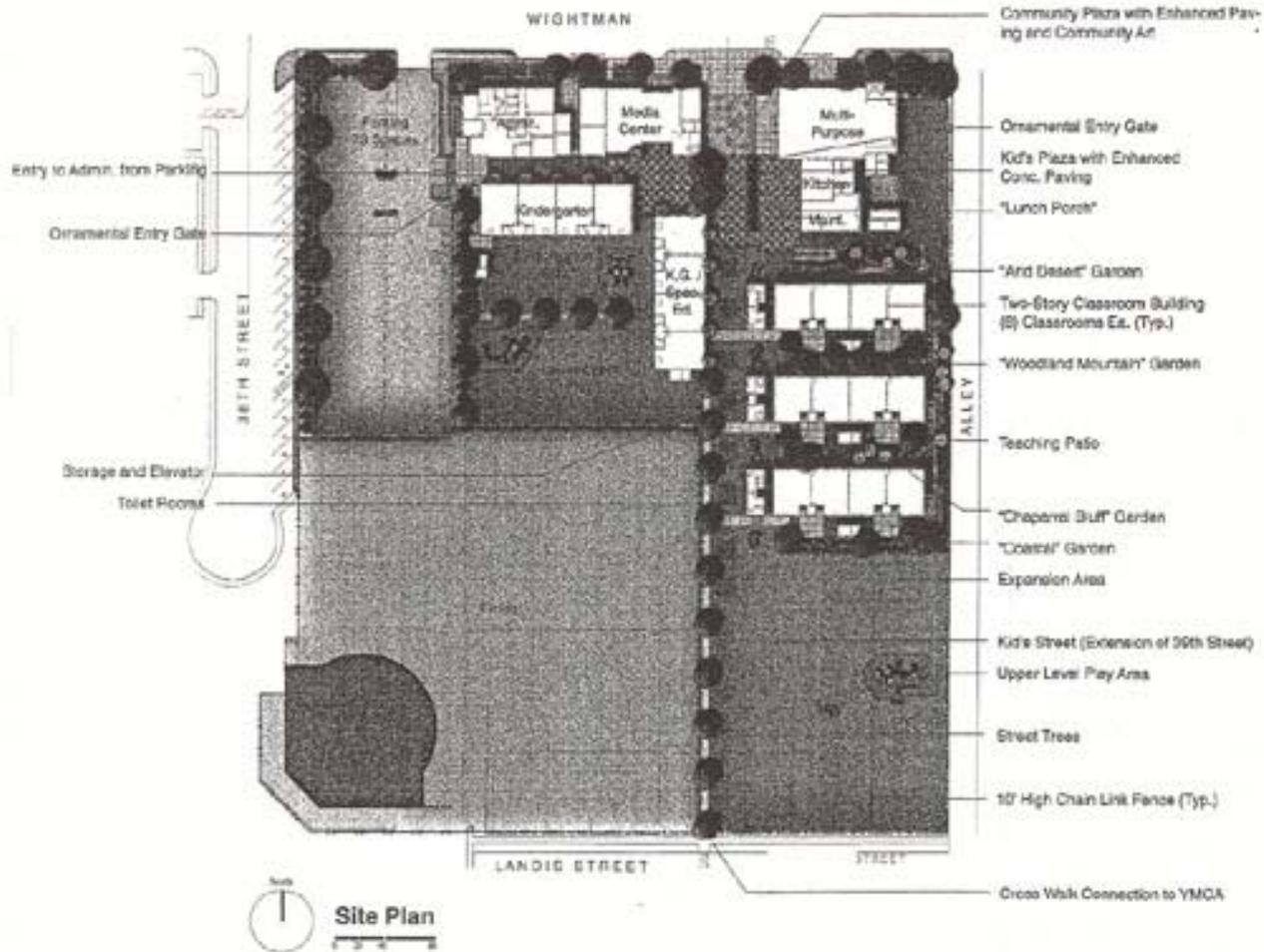
# Optimum Building Orientation



- Face major windows either north or south.
- Position classrooms so light and air can enter from two sides.
- Locate teaching areas away from noise sources, like roadways.



What's so hard about orientation?



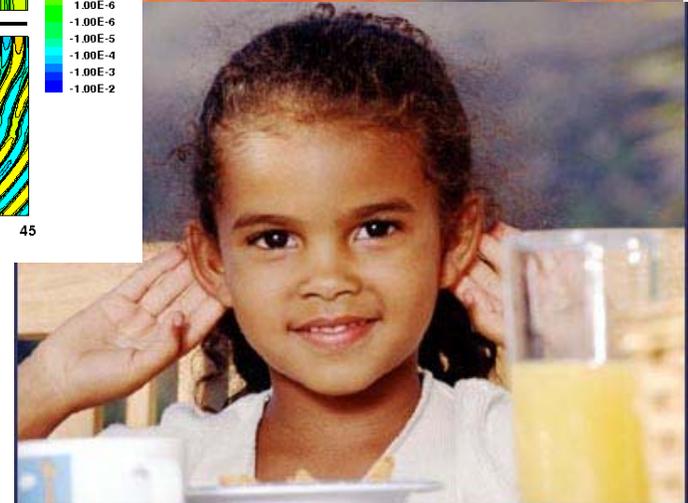
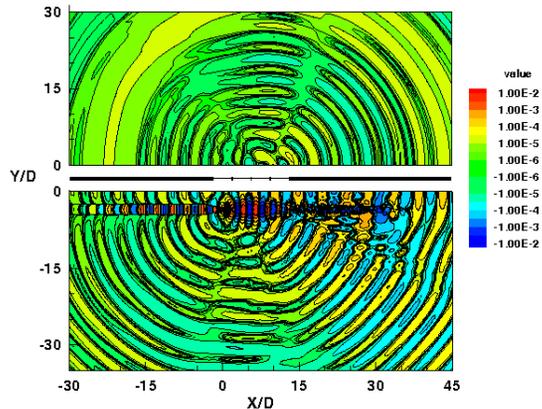
Cherokee Point Elementary School  
San Diego Unified School District

Courtesy RNP Architects



# Site Planning Criteria

- Orientation and solar control
- **Acoustics**
- Protecting and using natural features
- Zoning of the site for community Access

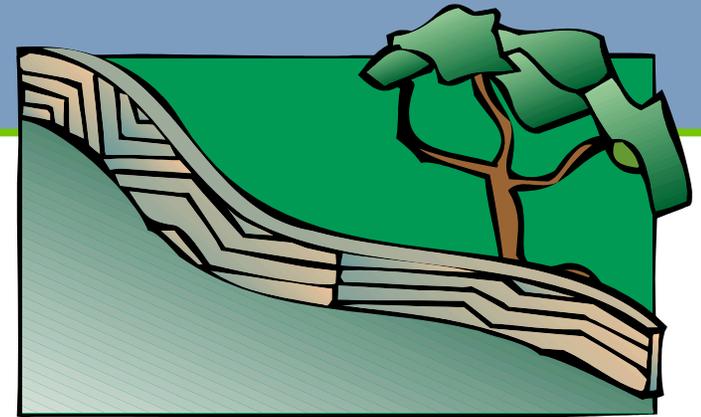




# Acoustics

## **Building orientation significantly affects acoustical performance:**

- Locate noise producers away from noise sensitive areas.
- Solid walls or berms of earth can reduce sound intrusion.
- Double glazed windows can control exterior noise; normal therma-pane double paned windows not effective.
- For low frequencies (traffic or aircraft noise), 2 – 4 inches of airspace and thicker laminated glass may be needed.



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# Protecting and Using Natural Features

## **A high performance school responds to its site:**

- Use shade and airflows for summer cooling and winter heating/wind protection.
- Reduce parking and building footprints.
- Keep long buildings and parking areas parallel to landscape contours to minimize land disruption.
- Preserve local vegetation and landscape with indigenous plants to restore damaged areas.



# Site Planning Criteria

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# Zoning of the site for community access

## **High performance schools are an important part of the local community:**

- Consider community gardens, school parks, meeting rooms.
- Consider multi-use facilities like day care, laundry, cafes.
- Joint-use partnerships with local nonprofit organizations can fund and share facilities.
- Connect to community through bike paths and public transportation.



# Transportation and Site Planning

- Use site design to connect the school to the community.
- Locate schools and design school sites to encourage car/vanpooling and pedestrian modes of transportation, rather than single-use automobile transportation.
- Incorporate safe and effective parking and storage for bicycles, skateboards, roller blades, scooters, etc.





# Alternative Fuel Vehicles

- Alternative fuel vehicles reduce pollutants and greenhouse gas emissions and educate students about greener alternatives for transportation.
- Buses, cars, and vans are available that use alternative fuels such as electricity, compressed natural gas, and biodiesel.
- Fueling stations for compressed natural gas and ethanol-fueled vehicles will need to be provided or be locally accessible.





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# Water Conservation and Landscaping





# Overview



- Design landscaping to use water efficiently by reducing water use and specifying hardy, native vegetation.
- Use recycled water for non-potable purposes.
- Set water use goals for the school and use efficient plumbing fixtures for urinals, showers and faucets.



# Landscaping & Irrigation Design Goals

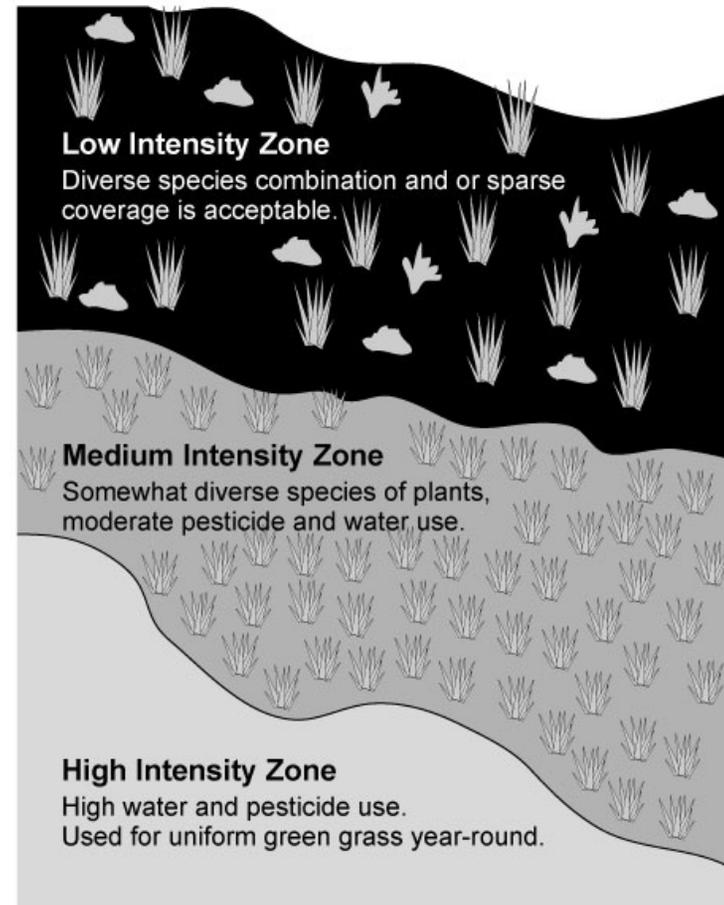
- Protect and/or restore the site.
- Incorporate the site's natural features to achieve high performance.
- Select environmentally preferable products.





# Landscape Design and Management

- Develop a landscape plan based on an ecological approach, emphasizing plant diversity, natural lawn care, and resource conservation.
- Include objective plans, tasks, standards, and requirements that provide information about how to create a healthy and attractive landscape.





# Native and Drought-Tolerant Plants

- Use vegetation that is drought-tolerant and native to the school's climate area.
- Preserve existing vegetation, especially groups of plants or significant specimens wherever possible.
- Design with hearty plants.
- Design landscapes with a minimal water-use budget, using low-flow irrigation systems.





# Landscaping Soil, Amendments, and Mulch



- Use organic soil amendments to help restore the health of disturbed soils.
- Where feasible and appropriate, use soil amendments and mulch with recycled content.



# Integrated Weed, Disease, and Pest Management

- Control and manage weeds, disease, and pests within tolerable limits to maintain the landscape in a manner that achieves attractive and healthy growth for plants, animals, and people while conserving energy and water.





# Issues Related to Turf (ball fields)



- Requires more irrigation.
- Higher cost and air pollution from maintenance.
- Liability and storm water issues related to pesticides and fertilizers.
- If close to buildings, may reduce temperature and glare to building.



# Water Efficient Irrigation

When irrigation is needed:

- Install drip or low-volume irrigation system connected to humidity sensors, if applicable.
- These systems are very cost-effective when compared to rising water costs and restrictions.





# Stormwater Management

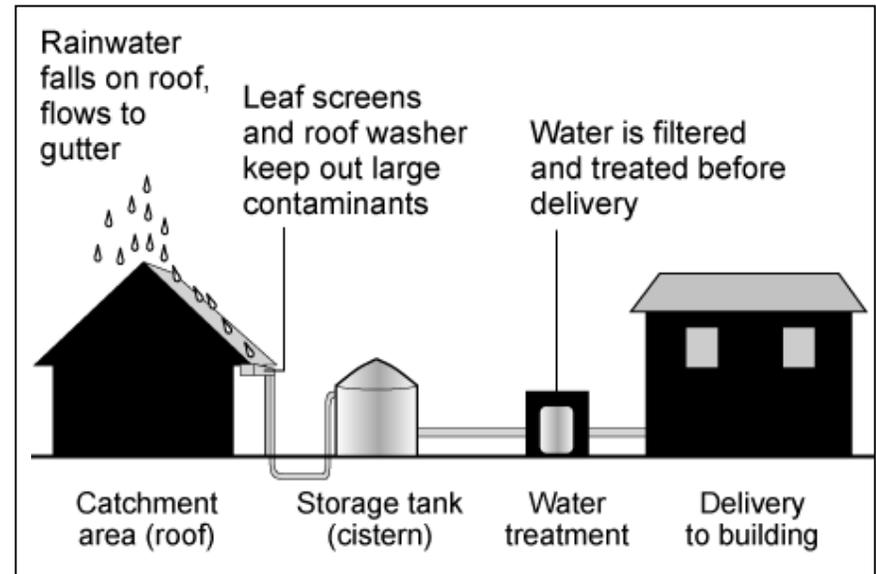
- Manage stormwater with systems that slow water velocity, maximize its use for irrigation, and filter pollutants.
- Use material-efficient options for on-site drainage systems.
- Groundwater should be managed separately from surface water.





# Rainwater Collection

- Consider rainwater collection systems to provide potable or non-potable water to the site.
- Rainwater can be used for showers, sinks, toilets, dishwashers.
- Weather conditions limit the applicability of these systems in colder climates.





# Efficient Plumbing Fixtures



- Low-flow fixtures, toilets, and urinals can reduce water consumption by 15-20%.
- Installing low-flow devices is simple and cost effective.