David Magney Environmental Consulting

WETLAND FUNCTIONAL ASSESSMENT OF THE ODYSSEY PROGRAM MIDDLE SCHOOL PROJECT, MALIBU, CALIFORNIA

Prepared for:

ODYSSEY PROGRAM

December 2001

Mission Statement

To provide quality environmental consulting services with integrity that protect and enhance the human and natural environment

DMEC

Wetland Functional Assessment of the Odyssey Program Middle School Project, Malibu, California

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PROJECT PURPOSE

The Odyssey Program wishes to provide education services to middle school ages to complement their existing elementary school. To accomplish this, the Odyssey Program is seeking permits to construct a small middle school adjacent to their existing elementary school. The purpose of this report is to assess the environmental benefits and/or impacts construction of the middle school building will have on the disturbed riparian Environmental Sensitive Habitat Area along Las Flores Creek.

The purpose of the wetland assessment is to determine how much and how the proposed project will change wetland functions of Las Flores Creek at the project site, and to assess how proposed riparian habitat mitigation will improve the wetland functions.

PROJECT BACKGROUND

The Odyssey Program is applying for a Conditional Use Permit from the County of Los Angeles to build a single two-story school building to add middle school grades to their existing elementary school facilities on the adjacent lot in the City of Malibu. The middle school site has previously contained trailer classrooms, built on a permanent foundation, for the Carden Malibu School, which was destroyed by a wildfire in the 1990s. As part of the middle school, the Odyssey Program must install a septic system and leach field.

David Magney Environmental Consulting (DMEC) previously conducted an inventory and assessment of biological and wetland riparian resources of the project site (DMEC 1999, 2001), and prepared a detailed wetland mitigation and monitoring plan for proposed work within environmentally sensitive riparian habitat on behalf of the California Coastal Commission (DMEC 1999) for the Carden Malibu School project.

Riparian ecosystem functions that will be disturbed or reduced as a result of construction, grading, or restoration activities will be restored onsite and in-kind. The overall mitigation objective is to have no net loss of wetland extent or **functions** resulting from project implementation. Upper floodplain riparian habitat that was previously disturbed by CalTrans and the old Carden Malibu School over the previous 40 to 50 years will be built upon for the Odyssey Program middle school. This area is not a wetland under Corps jurisdiction since it lacks wetland hydrology and hydric soil conditions; however, it is partially dominated by California Sycamore (*Platanus racemosa*), a riparian tree. No other riparian species occur within the building site.

Since the proposed wetland mitigation and biological impact assessment did not quantify the riparian/wetland functional impacts or benefits of the project and proposed onsite mitigation, the

Los Angeles County Environmental Review Board was not able to clearly determine how the habitat functions of the riparian corridor along Las Flores Creek would change as a result of the proposed project. Therefore, DMEC here presents a wetland functional assessment using the Hydrogeomorphic Rapid Assessment Method (HGM) to objectively demonstrate how the proposed wetland mitigation in fact improves (or degrades) wetland functions onsite.

This project targets the restoration of ecosystem functions through the restoration of geomorphic and biological attributes and processes on the Odyssey Program project site. Specifically, this project will restore native plant communities and structural diversity and, therefore, will restore the entire suite of riparian ecosystem functions to the Odyssey Program project site.

ASSESSMENT OBJECTIVES

The objectives of this assessment are to objectively and quantitatively determine what (and how much) wetland functions will be affected by building the Odyssey Program middle school at the former Carden Malibu School site. Riparian wetland ecosystems are known to provide a wide range of physical, biochemical, and biological functions. This assessment has three components; it will provide a comparative analysis of how the proposed middle school will change known wetland functions.

First, the assessment will determine the level at which each wetland function is operating, compared to reference standard sites. Then the assessment will measure what changes to wetland functions will occur as a result of building the middle school; and finally how the proposed enhancement mitigation will improve the wetland functions. This assessment will provide a numerical scoring of the project site under three scenarios: existing conditions, at build-out, and after mitigation completion.

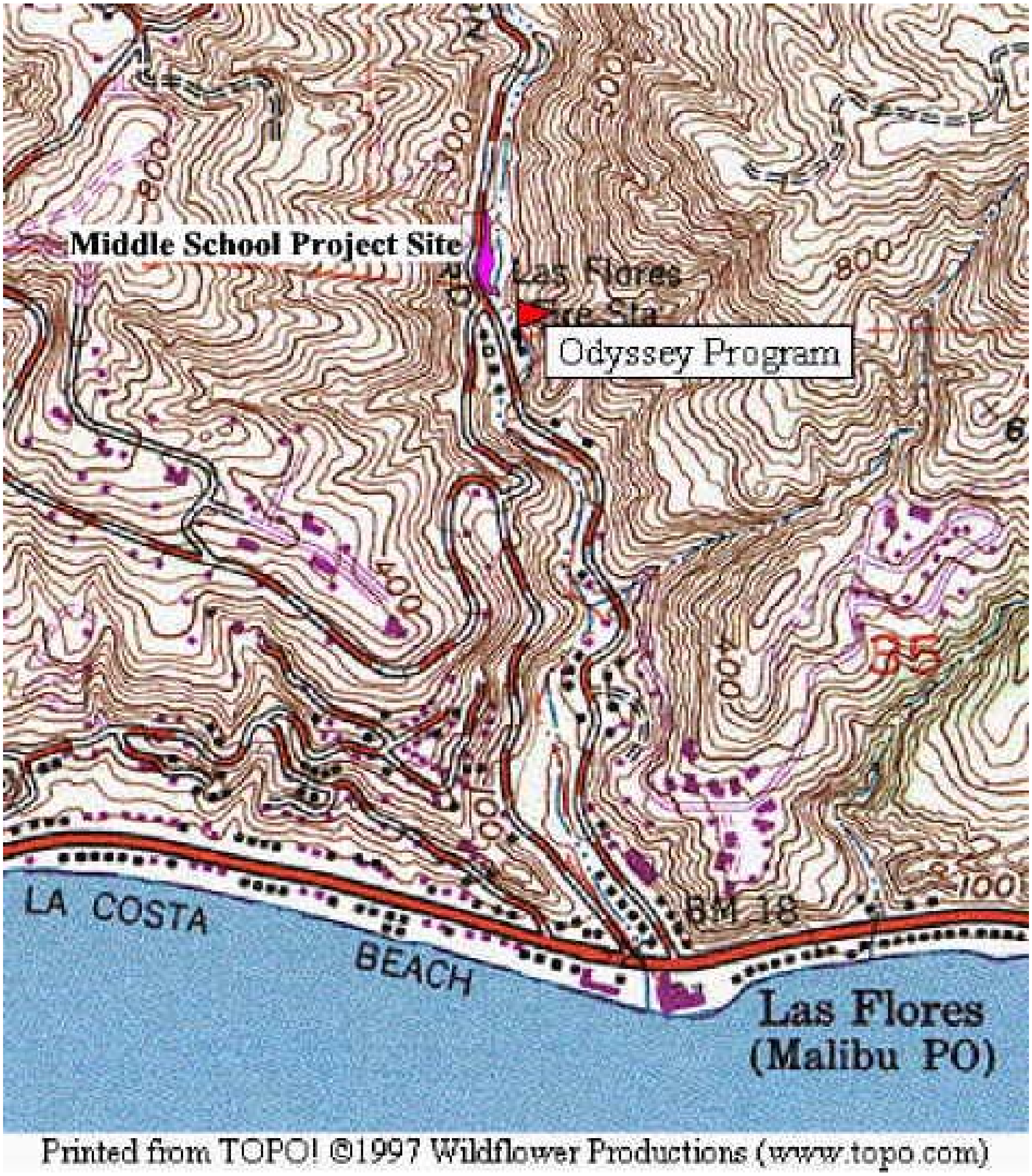
PROJECT LOCATION

The Odyssey Program School facilities (project site) are located immediately adjacent to the floodplain of Las Flores Creek, in Las Flores Canyon at the base of the Santa Monica Mountains, immediately North of the Malibu, California city limits. The proposed school facilities are located immediately west, and adjacent to, Las Flores Creek, at 3840 Las Flores Canyon Road, Malibu (Los Angeles County) (APN 4448-029-20). The site was previously occupied by the Carden Malibu School.

The project site is located approximately 0.7 mile north of the intersection of Los Flores Canyon Road and the Pacific Coast Highway (State Route [SR] 1), at the northern edge of the City of Malibu, Los Angeles County. The site is part of the former Topanga Malibu Sequit Mexican land grant, at geographic coordinates of 34°02’45”N latitude and 118°38’18”W longitude (Figure 1, Project Site Location Map). The project site is at an elevation of approximately 135 feet above sea level. Figure 2, Aerial Photograph of Las Flores Canyon, illustrates the relative location of the

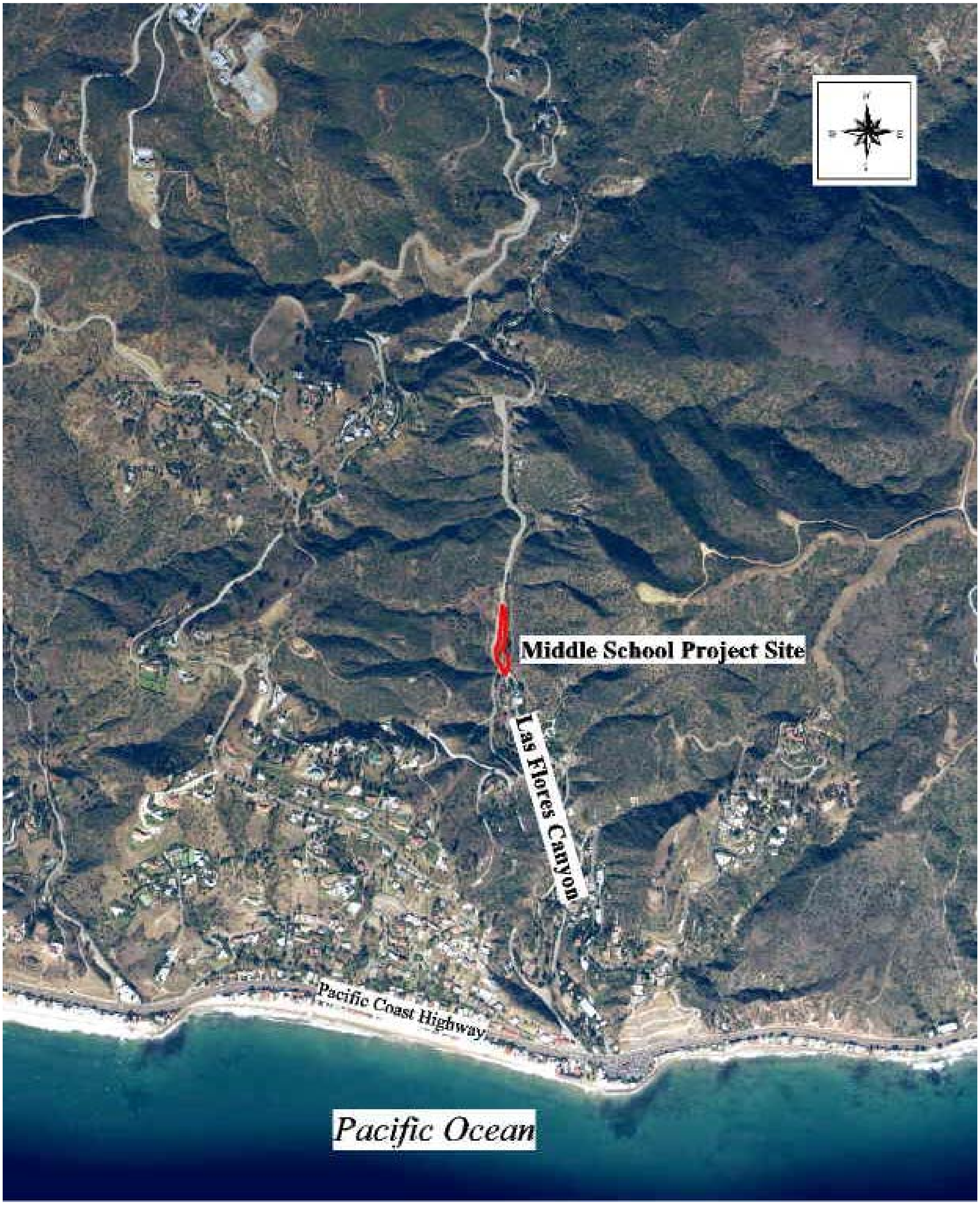
Odyssey Program school, the proposed middle school, and adjacent development within Malibu and adjacent undeveloped areas. The stream flows directly south through the property along the project site's east edge (Figure 3, Aerial Photograph of Odyssey Program Middle School Site).

Figure 1. Project Site Location Map



Scale approximately 1:6,000 USGS 7½-minute Malibu Beach, Calif. Quadrangle

Figure 2. Aerial Photograph of Las Flores Canyon



Source: Aerial photograph base is from AirPhotoUSA ©2001, dated 2000, State Plane Calif. Zone 5, NAD83

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Figure 3. Aerial Photograph of Odyssey Program Middle School Site

Source: Aerial photograph base is from AirPhotoUSA ©2001, dated 2000, State Plane Calif. Zone 5, NAD83

Jurisdictional Waters Determination

A delineation of waters of the U.S., including wetlands, has not been conducted for this project or HGM assessment. However, since these areas are confined within Las Flores Creek, DMEC assumes that the jurisdictional area, from the Corps' perspective, lies within the bed and banks of the creek. Waters of the State extend laterally to include riparian habitat, such as dominated by California Sycamore (*Platanus racemosa*); therefore, most of the project site can be considered as a riparian wetland from the State's perspective.

WATERS OF THE U.S.

For the purposes of this project, areas of waters of the U.S., under Corps jurisdiction, include the bed and banks of Las Flores Canyon Creek. This area is considered to be jurisdictional waters of the U.S, including wetlands. This also meets the CDFG wetland jurisdictional criteria as well as adjacent riparian vegetation. The project building site is located entirely outside jurisdictional waters of the U.S.

Wetlands

Jurisdictional wetlands, pursuant to Section 404 of the Clean Water Act, at the project site are located within Las Flores Canyon Creek, which is dominated by hydrophytes. This area is referred to as Sycamore-Willow Riparian Woodland. No project development is proposed within jurisdictional wetlands other than habitat enhancement.

Site Characteristics

Las Flores Canyon Road is immediately west of the project site. Sparse riparian vegetation occurs to the east of the building site, within the Las Flores Creek bed. The vegetation to the south consists of ornamental landscaping, at the Odyssey Program School site. The hillside slope east of Las Flores Creek is dominated by native Coastal Sage Scrub plant species, dominated by California Sagebrush (*Artemisia californica*), California Buckwheat (*Eriogonum fasciculatum*), and Laurelleaf Sumac (*Malosma laurina*).

The proposed Odyssey Program Middle School project site is highly disturbed, and consists of an old building site, a playground, perimeter fencing, a driveway, and a paved parking area to the north. The site contains scattered Coast Live Oak (*Quercus agrifolia*) and California Sycamore (*Platanus racemosa*) trees as well as many ornamental plantings. The west bank of Las Flores Creek has been partially improved with ungrouted rock riprap. The east bank of the creek is in a natural condition. A block and concrete floodway exists immediately downstream of the middle school site separating the Odyssey Program elementary school from Las Flores Creek.

The new building site occurs within historical upper riparian floodplain habitat of Las Flores Creek, and is adjacent to extant riparian wetlands categorized as both Riverine (Aquatic Bed and

Unconsolidated Bottom) and Palustrine (including Southern Willow Scrub and Coast Live Oak-California Sycamore Riparian Woodland) Systems, according to the U.S. Fish and Wildlife Service (USFWS) *Classification of Wetlands and Deepwater Habitats of the United States* (Corwardin et al. 1979). These habitats are discussed further in the Vegetation Types subsection below.

The proposed school building site area, within the fenced area, contains no native plant species, except for some California Sycamore and Coast Live Oak trees along Las Flores Canyon Road. One fire-damaged small Coast Live Oak and several California Sycamore trees would need to be removed to accommodate the new building. All other plants within the fenced area are either planted ornamentals or invasive exotic plants.

Native plants observed in the riparian corridor within the banks of Las Flores Creek include: Red Willow (*Salix lucida* ssp. *lasiandra*), Arroyo Willow (*S. lasiolepis*), California Sycamore, Mulefat (*Baccharis salicifolia*), Bush Mallow (*Malacothamnus* sp.), Laurelleaf Sumac (*Malosma laurina*), California Brickellbush (*Brickellia californica*), Mugwort (*Artemisia douglasiana*), Scarlet Monkeyflower (*Mimulus cardinale*), Narrowleaf Cattail (*Typha domingensis*), Lowland Everlasting (*Gnaphalium palustre*), and Common Horseweed (*Conyza canadensis*). Nonnative plants observed along Las Flores Creek include Myoporum (*Myoporum laetum*), Summer Mustard (*Hirschfeldia incana*), White Sweetclover (*Melilotus alba*), and Rabbitsfoot Grass (*Polypogon monspeliensis*).

Palustrine and Riverine habitats provide numerous important wildlife resources. The structure of the riparian community, in addition to the relatively high plant species diversity and richness, provides habitat necessary for foraging, nesting, and cover for many species. In addition, streams and rivers such as the Las Flores Creek are important sources of water for a variety of upland wildlife species. Riparian zones along rivers are also often used as migration/movement corridors by various species of wildlife including small and large mammals, birds, and reptiles. These movement corridors often connect habitat patches, and allow for physical and genetic exchange between animal populations. Wildlife can use riparian zones for cover while traveling across otherwise open areas.

Numerous species of wildlife are known to occur within the Las Flores Creek, and frequent the Palustrine and Riverine System habitats on a seasonal basis, and they regularly use resources provided by the creek.

DMEC conducted a search of the NDDB and found that several special-status species are known to occur within the Malibu region. These include: Braunton's Milkvetch (*Astragalus brauntonii*), Malibu Baccharis (*Baccharis malibuensis*), Plummer's Mariposa Lily (*Calochortus plummerae* ssp. *plummerae*), Blockman's Live-forever (*Dudleya blockmaniae* ssp. *blockmaniae*), Marcescent Live-forever (*Dudleya cymosa* ssp. *marcescens*), Santa Monica Mountains Live-forever (*Dudleya cymosa* ssp. *ovatifolia*), Southwestern Pond Turtle (*Clemmys marmorata pallida*), Coastal Western Whiptail (*Cnemidophorus tigris multiscutatus*), San Bernardino Ringneck Snake (*Diadophis punctatus modestus*), San Diego Mountain Ringneck Snake (*Lampropeltis zonata pulchra*), San Diego Horned Lizard (*Phrynosoma coronatum blainvillei*), San Diego Desert

Woodrat (*Neotoma lepida intermedia*), Monarch Butterfly (*Danaus plexippus*), and Santa Monica Shieldback Katydid (*Neduba longipennis*).

Of these special-status species, the San Diego Desert Woodrat is expected to nest in the Coastal Sage Scrub habitat on the east side of Las Flores Creek; Monarch Butterfly may roost in the California Sycamore trees onsite (but have not been observed to do so); and the Southwestern Pond Turtle and Santa Monica Mountains Shieldback Katydid may use habitats within Los Flores Creek seasonally. The Southwestern Pond Turtle requires sandy substrates for nesting and hibernation, which is not present at the Odyssey Program school building site.

While intensive field surveys for the wildlife species were not conducted, suitable habitat is lacking within the proposed construction site. The entire area around the project site was surveyed for special-status plant species; however, none were found in the area.

Vegetation Types

The proposed Odyssey Program Middle School project site occurs within historical riparian habitat, and adjacent to extant riparian wetlands categorized as both Riverine and Palustrine (wetland) Systems, according to the U.S. Fish and Wildlife Service (USFWS) *Classification of Wetlands and Deepwater Habitats of the United States* (Corwardin et al. 1979). The following wetland/riparian plant communities/habitat types (classes) comprise the vegetation at and adjacent to the project site:

- Riverine Aquatic Bed;
- Riverine Unconsolidated Bottom;
- Palustrine Broad-leaved Deciduous Scrub/Shrub Wetland (Southern Willow Scrub); and
- Palustrine Mixed Broad-leaved Forested Wetland. (Cowardin et al. 1979.)

The building site, which formerly contained a large mobile trailer classroom, is located on a floodplain terrace of Las Flores Creek. The predominant (but sparse) vegetation type is riparian (Palustrine Broad-leaved Winter-deciduous Scrub-shrub Wetland), which includes Southern Willow Scrub. The partially developed floodplain area (Las Flores Canyon ESHA as defined by the California Coastal Commission) is dominated by Coastal Live Oak-California Sycamore Riparian Forest/Woodland (Palustrine Mixed Broad-leaved Forested Wetland). This habitat type is considered a sensitive plant community by the California Department of Fish and Game (CDFG) (Holland 1986), and is tracked in CDFG's Natural Diversity Database (CNDDB) (2000).

RIVERINE SYSTEM

A Riverine system includes all wetlands and deepwater habitats contained within a channel, with two exceptions: (1) wetlands dominated by trees, shrubs, persistent emergents, emergent mosses, or lichens; and (2) habitats with water containing ocean-derived salts in excess of 0.5‰. Channel is defined as a conduit that periodically or continuously contains moving water, or that forms a connecting link between two bodies of standing water. (Cowardin et al. 1979.)

Riverine Aquatic Bed

Riverine Aquatic Bed includes wetlands and deepwater habitats dominated by plants that grow principally on or below the water surface for most of the growing season in most years. Water regimes include: subtidal; irregularly or intermittently exposed; and regularly, permanently, semipermanently, or seasonally flooded. Riverine Aquatic Bed habitats represent a diverse group of plant communities that require surface water for optimum growth and reproduction. They are best developed in relatively permanent water or under conditions of repeated flooding. Plants are either attached to the substrate or free-floating in the water above the bottom or below the surface. (Cowardin et al. 1979)

Riverine Unconsolidated Bottom

Riverine Unconsolidated Bottom includes all wetland and deepwater habitats with at least 25 percent cover of particles smaller than stones, consisting of predominantly sand with finer and courser sediments intermixed, and a vegetative cover of less than 30 percent (Cowardin et al. 1979). Unconsolidated Bottom exists within the immediate creek bottom (within the scour lines) of Los Flores Creek and consists primarily of Riverwash materials (non-soils). Riverwash forms a natural barren habitat typical of active stream channels, and consists of highly stratified, water-deposited layers of stony, gravely, cobble-stone sand. It contains relatively small amounts of silt and clay and typically results from streambank erosion. Riverwash material is frequently inundated during high water flows immediately following storms. It is subject to frequent disturbance, scouring, and deposition, and the development and establishment of riparian vegetation is severely limited (Edwards et al. 1970). .

PALUSTRINE SYSTEM

The Palustrine system includes all nontidal wetlands dominated by trees, shrubs, persistent emergents, emergent mosses or lichens, and all such wetlands that occur in tidal areas where salinity due to ocean-derived slats is below 0.5%. The Palustrine System is bounded by upland or by any of the other four systems.

Palustrine Broad-leaved Winter-deciduous Scrub-Shrub Wetland

Palustrine Broad-leaved, Winter-deciduous Scrub-Shrub Wetland includes areas dominated by woody, broad-leaved, deciduous plants less than six meters tall (shrubs). The plant species of this plant community include true shrubs that are small or stunted due to environmental conditions. Scrub-Shrub Wetlands may represent a successional stage leading to Forested Wetland, or may be relatively stable communities. (Cowardin et al. 1979.)

Palustrine Broad-leaved Winter-deciduous Scrub-Shrub Wetland, reported along Los Flores Creek in the vicinity of the project site, is also floristically classified as Southern Willow Scrub (Holland 1986) or Arroyo Willow Series (Sawyer and Keeler-Wolf 1995). Southern Willow Scrub is a

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scrub community dominated by the broad-leaved winter-deciduous *Salix lasiolepis*. It forms dense riparian thickets, with scattered emergent California Sycamore and Coast Live Oak trees from the adjacent Forested Wetland, and has little understory development (Holland 1986). Arroyo Willow Series generally occurs in seasonally flooded or saturated, fresh water, wetland habitats, such as floodplains and low-gradient depositions along rivers and streams, at elevations below 1,800 meters (5,905 feet) (Sawyer and Keeler-Wolf 1995).

Palustrine Mixed Broad-leaved Forested Wetland

Palustrine Mixed, Broad-leaved, Forested Wetland is characterized by woody vegetation that is at least six meters tall (trees). It includes dominant riparian species with large leaves (as apposed to coniferous or needle-like leaves) that are either evergreen or winter-deciduous (falling during the winter season). (Cowardin et al. 1979.)

The woodland riparian plant community observed and classified within the Palustrine System along the Los Flores Creek banks is also classified as Coast Live Oak-California Sycamore Series (Sawyer and Keeler-Wolf 1995) or Southern Coast Live Oak Riparian Forest (Holland 1986). Southern Coast Live Oak Riparian Forest is an open to locally dense evergreen sclerophyllous riparian woodland dominated by Coast Live Oak. This plant community observed onsite consists of an important contribution of the broad-leaved, winter-deciduous California Sycamore. Southern Coast Live Oak Riparian Forest appears to be richer in herbs and poorer in understory shrub than other riparian communities. This plant community requires bottomlands and outer floodplains along larger streams, and occurs on fine-grained, rich alluvium in canyons and valleys of coastal southern California (south of Point Conception). (Holland 1986.)

Wildlife

Palustrine and Riverine habitats provide numerous important wildlife resources. The structure of the riparian community, in addition to the relatively high plant species diversity and richness, provides habitat necessary for foraging, nesting, and cover for many species. In addition, streams and rivers such as the Las Flores Creek are important sources of water for a variety of upland wildlife species.

Riparian zones along rivers are often used as migration corridors by various species of wildlife including small and large mammals, birds, and reptiles. These migration corridors often connect habitat patches, and allow for physical and genetic exchange between animal populations. Wildlife can use riparian zones for cover while traveling across otherwise open areas.

Numerous species of wildlife are known to occur within the Las Flores Creek, and frequent the Palustrine and Riverine System habitats on a seasonal basis, and they regularly use resources provided by the creek. Table 1, Wildlife Species of the Odyssey Program School Area, contains a list of animal species that are known to be associated with the Las Flores Creek in the area of the Odyssey Program School site, or which have potential to occur onsite based on suitability of habitat onsite and in the region. Those species designated as observed include wildlife for which the species was actually observed onsite or evidence of their presence was observed, such as tracts, calls (vocalization), or scat. Scientific nomenclature follows the AOI (1989) for birds, Burt and Grossenheider (1976) for mammals, Jennings (1983) and Stebbins (1985) for amphibians and reptiles, and Moyle (1976) for fishes. Habitat types follow the USFWS wetlands classification system (Cowardin et al. 1979).

The riparian wetland habitats onsite provide habitat for a number of wildlife, including invertebrates (aquatic and terrestrial), amphibians, reptiles, birds, and mammals. No fish have been observed in Las Flores Creek at the project site. Wildlife observed onsite are listed in Table 1, Wildlife Species of the Odyssey Program School Area.

Table 1. Wildlife Species of the Odyssey Program School Area

Scientific Name	Common Name	Habitat[1]	Occurrence[2]
	Invertebrates		
Trichocorixa sp.	Water Boatman	Riverine Aquatic Bed	Observed
Coleoptera:Hydrophilidae Family	Water Scavenger Beetle	Riverine Aquatic Bed	Observed
Iriodomyrmex humilis	Argentine Ant	Palustrine	Observed
Callirhytis quercuspomiformis	Live Oak Gallfly	Palustrine, Chaparral	Observed
Apis mellifera	European Honey Bee	Chaparral	Observed
Pieris rapae	European Cabbage Butterfly	Palustrine, Chaparral	Observed
Libellula saturata	Big Red Skimmer	Riverine Aquatic Bed	Observed
Oligochaeta Class	Earthworm	Riverine Aquatic Bed	Observed
	Amphibians		
Bufo boreas halophilus	California Toad	Riverine Aquatic Bed, Palustrine	Expected
Pseudacris regilla	Pacific Chorus Frog	Riverine Aquatic Bed, Palustrine	Observed
Hyla regilla	Pacific Treefrog	Riverine Aquatic Bed, Palustrine	Observed
Hyla californiae	California Treefrog	Riverine Aquatic Bed, Palustrine	Observed
Scaphiopus hammondi	Western Spadefoot	Riverine Aquatic Bed	Expected
Batrachoseps nigriventris	Black-bellied Slender Salamander	Riverine Aquatic Bed, Palustrine	Expected
Rana catesbiana	Bullfrog	Riverine Aquatic Bed, Palustrine	Observed
	Reptiles		
Elgaria multicarinatus	San Diego Alligator Lizard	Palustrine	Expected
Lampropeltis getulus californiae	California Kingsnake	Palustrine	Expected
Sceloporous occidentalis	Western Fence Lizard	Palustrine	Observed
Uta stansburiana elegans	Side-blotched Lizard	Palustrine	Observed
Pituophis melanoleucus annectens	San Diego Gopher Snake	Palustrine	Expected
	Birds		
Buteo lineatus	Red-shouldered Hawk	Palustrine	Expected
Accipter cooperi	Cooper's Hawk	Palustrine	Expected
Ardea herodias	Great Blue Heron	Riverine Aquatic Bed, Palustrine	Observed

[1] Habitat types follow the USFWS wetlands classification system (Cowardin et al. 1979).
[2] Occurrence definitions: Observed = direct or indirect observation of species; Expected = expected to occur onsite at least occasionally/seasonally based on presence of suitable habitat; Possible = potentially present onsite based on presence of suitable habitat; however, likelihood is low.

Scientific Name	Common Name	Habitat[1]	Occurrence[2]
Falco sparverius	American Kestrel	Palustrine	Observed
Colaptes cafer	Northern Flicker	Palustrine	Expected
Picioides pubescens	Downy Woodpecker	Palustrine	Expected
Picioides villosus	Hairy Woodpecker	Palustrine	Expected
Nycticorax nycticorax	Black-crowned Night Heron	Riverine Aquatic Bed, Palustrine	Expected
Ceryle alcyon	Belted Kingfisher	Riverine Aquatic Bed, Palustrine	Expected
Casmerodius albus	Great Egret	Riverine Aquatic Bed, Palustrine	Expected
Calypte anna	Anna's Hummingbird	Palustrine	Observed
Sayornis nigricans	Black Phoebe	Palustrine	Observed
Icterus galbula	Northern Oriole	Palustrine	Observed
Carduelis tristis	American Goldfinch	Palustrine	Observed
Psaltriparus minimus	Common Bushtit	Palustrine	Expected
Empidonax difficilis	Western Flycatcher	Palustrine	Expected
	Mammals		
Mustela frenata	Long-tailed Weasel	Palustrine	Expected
Mephitis mephitis	Striped Skunk	Palustrine	Expected
Procyon lotor	Raccoon	Riverine Aquatic Bed, Palustrine	Observed
Microtus californicus	California Vole	Palustrine	Expected
Didelphis virginiana	Virginia Opossum	Palustrine	Expected
Thomomys bottae	Botta's Pocket Gopher	Palustrine	Observed
Odocoileus hemionus	Black-tailed Deer	Palustrine	Observed
Canis latrans	Coyote	Palustrine	Observed
Lynx rufus	Bobcat	Palustrine	Observed
Felis concolor	Mountain Lion	Palustrine	Expected
Vulpes cinereoargenteus	Gray Fox	Palustrine	Expected

HGM ASSESSMENT ENVIRONMENTAL DATA

Physical environmental conditions are an important component of the natural environment as they directly or indirectly determine habitat conditions for the flora and fauna. Specific physical environmental parameters of Las Flores Creek and adjacent areas are also important for determining the level at which each wetland function is operating at. Table 2, Existing Channel Conditions on 13 December 2001, lists the values measured at the assessment area for the HGM assessment. These data are summarized from field data sheets included as Appendix A.

There are no published data on stream flows or water quality in Las Flores Canyon Creek; there are no stream flow gages on the creek.

Table 2. Existing Channel Conditions on 13 December 2001

Parameter	Measured Value
Average Stream Width	31.5 ft
Mean Depth	8 ft

Parameter	Measured Value
Channel Roughness	5-25 %
Dominant Bed Material Class Size	10-23.6” diameter
Channel Bed Material Embeddedness	51 %
Channel Bed Matrix (dominant bed material)	60% gravels
In-channel Coarse Woody Debris (volume)	3.7 cf
Decomposition Classes (# of classes of decay observed)	2
Pool Density (no. of pools/100 ft)	12
Herbaceous Cover on Channel Banks	48 %
Seedling Cover on Channel Banks	7 %
Shrub Cover on Channel Banks	36 %
Tree Cover on Channel Banks	28 %
Vine Cover on Channel Banks	8 %
Basal Area of Trees	3.35 sq.ft/acre
Basal Area of Snags	0 sq.ft/acre
Average Total Number of Vegetation Strata	3
Ratio of Native to Exotic Dominant Plants	8:1
Off-Channel Coarse Woody Debris (volume)	3.7 cf
Canopy Cover Over Stream	9 %
Soil Profile Integrity in Buffer Area	disturbed
Sediment Inputs into Channel	0
Surface Water Inputs into Channel	0
Man-made Features on Channel Banks	2
Man-made Features Crossing Channel (# of features)	0
Animal Signs (# of wildlife classes observed)	4
Buffer Width (average width of vegetated buffers)	68.3 ft.
Buffer Condition (% cleared of natural vegetation)	25 %
Buffer Continuity (man-made breaks in buffer area)	0

These data are used in the HGM wetland functional assessment for the project site and are described in the following section.

WETLAND ASSESSMENT

WETLAND ASSESSMENT METHODS

DMEC assessed the Odyssey Program project site wetlands to determine what functions are present and what levels each of the wetland functions are operating. DMEC also used the same approach to determine wetland function levels at the project site as if the middle school were built without mitigation, and again with mitigation implemented, resulting in three separate assessments of the site.

Since the functions of wetlands can be complex and sometimes difficult to accurately assess, DMEC used a DMEC-proprietary version of an existing draft wetland assessment model. The functions of the wetlands considered under this assessment were based on a rapid assessment method currently under development nationwide by the Corps and EPA, known as the Hydrogeomorphic (HGM) approach (Smith et al. 1995). The HGM approach depends on development of local models for each biogeographic region for each general wetland type: riverine, estuarine, lacustrine fringe, depressional, slope, and flat. The wetland type onsite is riverine.

Three regional riverine wetland HGM models are currently under development in California coastal areas that may be applicable to the Malibu region:

- Draft Guidebook to Hydrogeomorphic Functional Assessment of Riverine Waters/Wetlands in the Santa Margarita Watershed (Santa Margarita HGM) (Lee et al. 1997);
- Draft Guidebook to Functional Assessments in 3rd and 4th Order Riverine Waters/Wetlands of the Central California Coast (Central Coast HGM) (Lee et al. 1996); and
- Draft Guidebook for Reference-Based Assessment of the Functions of Riverine Waters/Wetlands Ecosystems in the South Coast Region of Santa Barbara County, California (Santa Barbara South Coast HGM) (Lee et al. 2001).

In addition, DMEC has gathered wetland reference data from 49 sites on behalf of the Coastal Conservancy within the Calleguas Creek Watershed, which is nearby in southeastern Ventura County. DMEC staff has used the Central Coast HGM model previously on the Los Osos Sewer Project EIR (Fugro West, Inc. 1996) in the Morro Bay area of San Luis Obispo County, the Cohan Development Wetland Mitigation and Monitoring Plan (ENSR 1997) in Thousand Oaks, Ventura County, and for the Reinke wetland restoration project in Thousand Oaks (DMEC 2000a). The U.S. Environmental Protection Agency (EPA) and Los Angeles District of the Corps is currently considering use of the Santa Margarita HGM model for the South Coast region of Southern California from Point Conception to Mexico (Butterwick pers. comm. 1997, Stein pers. comm. 1997). DMEC (1997) used the Santa Margarita HGM model in assessing project-related impacts for the proposed Bridle Ridge project in Santa Barbara County and the Reinke project in Thousand Oaks.

Las Flores Canyon Creek and its tributaries are considered Riverine wetlands under the HGM wetland assessment approach. The Santa Barbara County South Coast Streams HGM Model (Lee et al. 2001), developed for Santa Barbara County and EPA, is used here to assess and compare original wetland functions of the Odyssey Program project site with projected post-mitigation project conditions.

The three riverine models listed above identify fourteen critical functions that streams such as Las Flores Canyon Creek fulfill:

1. Maintenance of characteristic channel dynamics;
2. Dynamic surface water storage and energy dissipation;
3. Long-term surface water storage;
4. Dynamic subsurface water storage;
5. Nutrient cycling;
6. Detention of imported elements and compounds;
7. Detention of particulates;
8. Organic carbon export;
9. Maintain characteristic plant community;
10. Maintain characteristic detrital biomass;
11. Maintain spatial structure of habitat;
12. Maintain interspersion and connectivity;
13. Maintain taxa richness of aquatic macroinvertebrates; and
14. Maintain spatial distribution of vertebrates.

While methods to rapidly assess Functions 13 and 14 have not yet been developed for the three coastal California riverine HGM regional models, the application and use of several of the wetland variables described in the models were used by DMEC to indirectly evaluate them in this wetland assessment. The HGM functional assessment approach was used to determine the index for each function for both pre- and post-project conditions. The wetland functions can be grouped into three general functions: hydrologic (Functions 1-4), biochemical (Functions 5-8), and habitat (Functions 9-14).

Riverine wetlands in the Las Flores Canyon Creek Watershed can be characterized as performing various hydrology/geomorphology, biogeochemistry, plant habitat, and wildlife habitat functions (Table 3, Ecosystem Functions of Riverine Wetlands) (adapted from DMEC 2000b). The performance of these functions is largely dependent upon the maintenance of natural channel morphology and native plant communities.

Only a small portion of the native vegetation outside of the existing stream will be altered by the proposed project. Thus, the completion of the proposed project will have some negative effects on the overall ecosystem function of the Las Flores Canyon Creek and the associated riparian wetlands without mitigation. DMEC used the Santa Barbara South Coast HGM for the assessment of wetland functions affected by the Odyssey Program middle school project.

Table 3. Ecosystem Functions of Riverine Wetlands

Function	Definition
Hydrology/Geomorphology	
Maintain Alluvial Corridor Integrity	Maintenance of physical attributes and processes that result in characteristic channel width, depth, slope, and roughness.
Maintain Surface Water Hydrology	Maintenance of a characteristic hydrograph, including the amount and time of water delivery to the channel network.
Maintain Subsurface Water Hydrology	Maintenance surface and ground water interactions between the channel and the local and regional aquifers.
Sediment Mobilization, Transport, and Storage	Maintenance of a characteristic sediment regime through the maintenance of a hydrograph and sediment delivery to the stream network.
Biogeochemistry	
Element and Compound Cycling	Abiotic and biotic processes that convert elements and compounds from one form to another.
Organic Carbon Export	Export of dissolved and particulate carbon, primarily through leaching and flushing.
Plant Habitat	
Maintain Native Plant Association	Maintenance of characteristic plant associations in terms of species composition of trees, saplings, seedlings, shrubs, and herbs.
Maintain Spatial Structure of Plant Association	Maintenance of the structural characteristics required for supporting native plant habitat and their animal associates.
Maintain Characteristic Detrital Biomass	The production, accumulation, and dispersal of dead plant biomass of all sizes. The sources may be up slope, up gradient, or on site.
Maintain Interspersion and Connectivity for Plant Populations	Maintenance of characteristic spatial relationships between plant habitats such that native plant species are capable of completing their life cycles.
Wildlife Habitat	
Maintain Native Vertebrate Associations	Maintenance of the diversity, density, and spatial distribution of aquatic and terrestrial vertebrates.
Maintain Native Invertebrate Associations	Maintenance of the diversity, density, and spatial distribution of aquatic and terrestrial invertebrates.
Maintain Interspersion and Connectivity for Animal Populations	Maintenance of characteristic spatial relationships between animal habitats such that native animal species are capable of completing their life cycles.

The HGM model considers the state of twenty-eighteen variables that are assessed in various combinations to measure the level of functioning for each of the fourteen wetland functions, to come up with an index score for each function. Each index is scaled based on reference standards that were established for the Santa Barbara South Coast region, located in Santa Barbara County

(Lee et al. 2001). Lee et al. (2001) cautions, however, that the model may not be accurate in all aspects outside the reference domain, the Santa Barbara County south coast region. With this caveat in mind, the Santa Barbara South Coast HGM model is applied to this project.

What the model does for this project is provide a systematic method to measure the relative change in wetland functions the proposed project will have, identifying those specific variables and functions that are expected to change, and providing the permitting agencies a relative numerical measurement of pre-project (baseline) and post-project conditions (after mitigation). Table 4, Riverine HGM Model Variables, lists the 28 variables that were used to scale the index for each wetland function.

Table 4. Riverine HGM Model Variables (from Lee et al. 2001)

Acronym	Variable	Definition
1. VASIGN	Direct Observations and/or Indicators of Animal Presence or Utilization of the Assessment Area	The number of direct (e.g. visual observation of animals) or indirect (e.g. tracks, bedding, scat) observations of animal species presence in or utilization of the Project Assessment Area (PAA).
2. VBUFFCOND	Buffer Condition	Predominant land use or condition of the designated stream buffer - 50 feet (urban) or 100 feet (rural).
3. VBUFFCONT	Buffer Contiguity	The linear extent of the vegetated buffer on both sides of the stream channel, parallel to the top-of-bank (TOB).
4. VBUFFWIDTH	Buffer Width	Buffers (setbacks) are designated widths of land adjacent to the stream (from TOB landward) that are necessary to protect biological productivity, water quality, and hydrological characteristics of the stream.
5. VCHANROUGH	Channel Roughness	Channel roughness is an indicator of the hydraulic resistance produced by natural, immobile features of the channel system below ordinary high water (OHW). Examples of features that produce resistance to flow in channels include (a) boulders transported to the site by episodic large events such as debris flows, (b) bridge abutments, (c) rip-rap, (d) large, buried and fixed coarse woody debris, (e) bedrock, etc. Channel roughness is expressed as percent of the channel cross sectional area occupied by roughness elements that are relatively immobile during flood events.
6. VDECOMP	Decomposition	Mode (most frequent) and average number of decomposition classes of coarse woody debris below OHW and within PAA.
7. VEMBED	Embeddedness of Large Channel Materials	The degree that large class channel bed material is buried in finer sediment. Specifically, embeddedness is the percent burial of the D84 or larger channel bed material by material less than D84.

Acronym	Variable	Definition
8. VHERBCC	Herbaceous Cover	Percent cover of herbaceous vegetation, including graminoids, forbs, ferns, and fern allies within the Assessment Area.
9. VINCWD	In Channel Coarse Woody Debris	Volume of down and dead trees and/or limbs (>3" diameter) within the channel and below OHW.
10. VLANDUSE	Land Use	Land use, as calculated from the Enhanced Thematic Mapper (ETM) Landuse Classification map, within the reference site subwatershed.
11. VLONGPROF	Longitudinal Profile	The integrity of the natural longitudinal profile of the channel within and/or upstream and downstream from the main channel cross-section.
12. VOFFCWD	Out of Channel Coarse Woody Debris	Volume of down and dead trees and/or limbs (>3" diameter) above OHW within the PAA.
13. VPATCHAREA	Area of Patches	The relative area of habitat patches, as calculated from the ETM Habitat Patch Analysis map, within the 1,000' radius AA surrounding the reference site.
14. VPATCHCONTIG	Contiguity of Patches	The contiguity of habitat patches, as generated from the ETM Habitat Patch Contiguity Analysis, within the reference site subwatershed.
15. VPATCHNUM	Number of Patches	The number of habitat patches, calculated from the ETM Habitat Patch Analysis map, within the 1,000' radius AA surrounding the reference site.
16. VRATIO	Ratio of Native to Non-Native Plant Species	Ratio of native to nonnative dominant plant taxa within the project AA.
17. VREGEN	Regeneration	Regeneration of plants from seedlings, saplings, and clonal shoots within the AA.
18. VRESIDPOOL	Residual Pool	The number and average distance between residual pools >10 ft^2 in area and >0.5 ft deep (at their deepest point) within the PAA at low flow to base flow conditions.
19. VSED	Sediment Deposition	Sources and amount of sediment delivery and deposition to waters/wetlands from upgradient landscape positions.
20. VSHADE	Shade Over the Channel below Ordinary High Water	Tree, shrub, and undergrowth vegetation canopy cover overhanging the active stream channel.
21. VSHRUBCC	Shrub Canopy Cover	Percent canopy cover of shrubs (multiple stemmed woody species) within the AA.
22. VSNAGS	Snags	Basal area of standing dead trees (snags) (> 3" DBH).
23. VSOILINT	Soil Profile Integrity	A measure of the presence and condition of the soil profile (soil horizons) within the AA.
24. VSTRATA	Strata	The number of distinct vegetation layers present within the riparian zone of the project AA. Vegetation strata were defined as follows: • trees (single stem woody species with >3" DBH and > 10 ft. tall); • shrubs (multiple stem woody species); vines

Acronym	Variable	Definition
		or lianas (woody vines); and • herbs, including forbs, graminoids, ferns, and fern allies.
25. VSURFIN	Surface Water In	Surface hydrologic connections into the PAA from the adjacent landscape.
26. VTREEBA	Basal Area of Trees	The basal area of trees (single stem woody species with >3" DBH and > 10 ft. tall) within a representative acre of the Assessment Area.
27. VTREECC	Tree Canopy Cover	Percent canopy cover of trees (single stem woody species with >3" DBH and > 10 ft. tall).
28. VVINECC	Vine Canopy Cover	Percent canopy cover of vines or lianas (woody vines) within the AA.

Index formulas have been developed by Lee et al. (2001) (Functions 1 through 12) and by DMEC (Functions 13 and 14) to capture the components (variables) of each wetland function. These formulas are then used to scale the level at which the wetland is functioning, independently for each function. Table 5, Riverine HGM Model Index Formulas, lists the index formulas used for this assessment. DMEC used the "moderate gradient" formulas since the stream gradient was greater then 2% for the appropriate variables.

DMEC took visual measurements or estimates on the condition of each of the 28 wetland variables and recorded them onto field data sheets for each assessment area to determine each variable's score. This was performed for baseline (existing) conditions, for project conditions upon build-out without mitigation, and for post-project conditions after mitigation implementation. Post-project conditions for each variable represents an estimate of environmental conditions and cannot be accurately measured until after the project has been constructed and in place; therefore, the scores for these conditions should be considered preliminary; however, DMEC used best professional judgment for these scores. The HGM model allows the modeler to estimate future conditions based on comparisons with other reference sites.

The results of the HGM wetland functional assessment at the Odyssey Program middle school site are presented below in Wetland Function Assessment Results.

Table 5. HGM Model Index Formulas[3]

Index Formulas for Each Function
1 ((VINCWD)+(VHERB+VSHRUB+VTREEBA)/3+(VBUFFCONT+VBUFFCOND+VBUFFWIDTH)/3+(VCHANROUGH))/4
2 (VSED+VSOILINT+VRESIDPOOL)/3
3 (VLONGPROF+VSOILINT+VSURFIN+VLANDUSE+(VBUFFCONT+VVBUFFCOND+VBUFFWIDTH)/3)/5
4 ((VHERB+VSHRUB+VVTREEBA)/3+(VBUFFCONT+VBUFFCOND+VBUFFWIDTH)/3+VEMBED+VSED+VCHANROUGH))/5
5 ((VSOILINT+VSED)/2+(VINCWD+VOFFCWD)/2+(VHERB+VSHRUB+VTREEBA)/3+(VBUFFCONT+VBUFFCOND+VBUFFWIDTH)/3+(VDECOMP))/5
6 ((VHERB+VSHRUB+VTREEBA)/3+(VBUFFCONT+VBUFFCOND+VBUFFWIDTH)/3+(VSOILINT+VSED)/2+VLONGPROF)/4
7 ((VHERBCC+VSHRUBCC+VTREEBA)/3+(VBUFFCONT+VBUFFCOND+VBUFFWIDTH)/3+(VCHANROUGH)+(VSED)+(VEMBED))/5

[3] From Lee et al. 2001 except formulas for Functions 13 and 14 developed by DMEC.

Index Formulas for Each Function
8 ((VINCWD)+(VDECOMP)+(VHERB+VSHRUB+VTREEBA)/3+(VBUFFCONT+VBUFFCOND+VBUFFWIDTH)/3+(VLONGPROF))/5
9 ((VTREECC+VSHRUBCC+VVINECC+VHERBCC+VREGEN)/5+VRATIO+VSTRATA+VTREEBA)/4
10 (VSNAG+((VOFFCWD+VINCWD)/2)+VDECOMP)/3
11 ((VASIGN+(VBUFFCOND+VBUFFCONT+VBUFFWIDTH)/3+(VSHADE+VRESIDPOOL+VSNAG+VSTRATA)/4)/3
12 ((VPATCHNUM+VPATCHAREA+VPATCHCONTIG)/3+VLANDUSE)/2
13 (VASIGN+(VBUFFCOND+VBUFFCONT+VBUFFWIDTH)/3+VHERBCC+VINCWD+VLANDUSE+VOFFCWD+(VPATCHAREA+VPATCHCONTIG+VPATCHNUM)/3+VRATIO+VREGEN+VRESIDPOOL+VSHRUBCC+VSNAGS+VSTRATA+VTREECC+VVINECC)/15
14 (VASIGN+(VBUFFCOND+VBUFFCONT+VBUFFWIDTH)/3+VCHANROUGH+VDECOMP+VHERBCC+VINCWD+VLANDUSE+VLONGPROF+VOFFCWD+(VPATCHAREA+VPATCHCONTIG+VPATCHNUM)/3+VREGEN+VRESIDPOOL+VSHRUBCC+VSNAGS+VSOILINT+VSTRATA+VTREECC+VVINECC)/18

REGULATORY CONTEXT

This plan is prepared to meet regulatory requirements, issued by the Corps and the CDFG and concerns by the Los Angeles County Environmental Review Board and the Coastal Commission, to mitigate for unavoidable impacts to waters of the U.S., including wetlands, incurred during the development of a middle school for the Odyssey Program on the Armstrong property. (Note: the project will not directly affect jurisdictional waters of the US, except through implementation of riparian habitat restoration and enhancement.)

Historically, the effectiveness of restoration of waters/wetlands has been measured using an area metric alone. However, the Clinton Administration Wetlands Policy (1993) mandated that:

- "...all wetlands are not the same...";
- a fair, flexible approach should be encouraged that allows restoration of waters/wetland functions; and
- a hydrogeomorphic approach to restoring waters/wetlands functions should be used.

The restoration of functions is a preferable alternative to habitat enhancement and/or creation (Kusler and Kentula 1989). This is reflected in the Memorandum of Agreement (MOA) on Mitigation of 6 February 1990 that guides policy nationally for the U.S. Environmental Protection Agency (EPA), the Corps, and the U.S. Fish and Wildlife Service (USFWS). The MOA sets forth specific guidelines to:

> "...restore and maintain the chemical, physical, and biological integrity of the Nation's waters, including wetlands".

Consistent with these directives, the approach presented herein involves the restoration of physical, chemical, and biological attributes and processes to the impacted waters of the U.S., including wetlands, on the Odyssey Program project site. Although the overall area of upper terrace riparian floodplain habitat is reduced by approximately 0.23 acre, overall ecosystem function will be restored by maintaining natural stream morphology and enhancing riparian habitat conditions with a more compositionally and structurally diverse assemblage of plant communities.

APPROACH

The general technical approach to the restoration/enhancement by DMEC is to focus on the physical and biological processes related to stream flow and sediment mobilization, transport, and deposition. Trying to enforce constraints on a river, even in a restoration context, often results in the failure of the effort (Gilvear and Bradley 1997). Thus, DMEC works with the natural physical and biological processes rather than fighting against them.

Some streams are resilient to perturbation and can restore to pre-perturbed conditions in relatively short periods of time (Hecht 1984, Gilvear and Bradley 1997); however, removing the perturbation and not assisting in the restoration often results in incomplete restoration of the physical and biological attributes and processes of the ecosystem (Kondolf 1993). Therefore, the general approach to this restoration is to work with the physical attributes and processes to guide the restoration, but to rely upon the natural physical and biological processes of the stream system to complete the project.

The project site only contains a short segment of Las Flores Canyon Creek and the project will not directly alter the bed or banks of the creek. Regardless, building within the historic floodplain and within riparian vegetation, even if it is disturbed, affects one or more wetland functions.

The proposed restoration site will be planted at varying densities, with suitable indigenous riparian trees and shrubs, and will receive selective erosion-control treatment, using bioengineering techniques and materials. These treatments will provide erosion protection of the mitigation plantings. The existing rock riprap already provides protection from lateral bank erosion; however, the riprap is not conducive to riparian plantings. Therefore, DMEC proposes that the enhancement plantings be placed in added topsoil placed over the riprap in selected areas.

Specifically, the approach for the restoration/enhancement at the Odyssey Program middle school site includes, but is not necessarily limited to:

- Installing sediment retaining devices made of natural materials (e.g. coir rolls and blankets), if necessary;
- Removing existing nonnative, exotic plants from the entire project site;
- Collecting cuttings and seeds, if necessary, and propagating wetland/riparian plants;
- Installing temporary irrigation systems, where appropriate;
- Planting with native plant material (pole cuttings and seeds) and nursery-grown plants;
- Monitoring the work of the grading and planting contractors; and
- Monitoring the mitigation plantings for a 5-year period.

MITIGATION CONSTRAINTS

The episodic nature of weather and, therefore, stream discharge and sediment supply bears discussion. Flood events are episodic on the South Coast of California. For example, over a 29-year period (water years 1960-1988), annual peak flows in the Ventura River near Meiners Oaks varied from 38 cfs to 28,000 cfs (USGS Gage #11116550). Daily variations in flows also can be highly variable. During the 12 February 1992 flood, discharge in the Ventura River near Ventura increased from 100 cfs to 46,700 cfs in a period of three hours (Keller and Capelli 1992). While Las Flores Canyon Creek certainly does not carry the flows or velocities of the Ventura River, its dynamic hydroregime is relatively similar, just much lower in volume of sediments and water.

The Las Flores Canyon watershed is approximately 4.5 sq. miles with a circumference of approximately 10 miles. It ranges in elevation from sea level (Pacific Ocean) to 2,775 feet at Saddle Peak (located approximately 2.4 miles NNW from the project site). Las Flores Canyon Creek width to drainage area is similar to the reference standard streams in the same landscape position in the South Coast Santa Barbara County reference domain.

High sediment flux events also are episodic and often are related to wildfires coupled with high flows. Sediment rating curves may shift upwards 10 to 20 percent following significant wildfires, resuming their pre-fire relationships after two to five years (Wells and Brown 1982, Taylor 1983, Hecht 1984). A specific example is the Sisquoc River east of Santa Maria, California where more than half of the bed load transported during a 60-year period was probably associated with the 1966 fire that burned approximately 35 percent of the watershed and the January to February 1969 high flows (Hecht 1993).

Fluvial geomorphologists have long recognized the unique geomorphic responses to episodic flood/high sediment flux events. Short-term variations in flow can result in a channel morphology that is adjusted to high flows but is not in equilibrium with subsequent low flows (Schumm and Lichty 1963). For example, the channel morphology created during high flows on alluvial fans may be completely reconfigured during low-flow events. The result is that subsequent high flows may not follow the previous paths and kinetic energy may be dissipated in previously unaffected areas (Dawdy 1979).

The episodic nature of flows and sediment fluxes cannot be controlled in stream restoration efforts. Thus, restoration in episodic stream systems must account for this inherent uncertainty. The episodic paradigm is based on episodic cycles of perturbation and recovery, not on the development of equilibrium landforms and mature habitats. Concepts and tools that are useful in other systems, such as channel-forming discharge dimensions, are less useful and must assume less significant roles. Similarly, design specifications and success criteria must be flexible to allow the natural physical processes to operate on the landscape.

WETLAND FUNCTION ASSESSMENT RESULTS

The wetland functions at the Odyssey Program middle school project site were assessed for three separate conditions: existing (baseline) conditions, middle school built without mitigation, and middle school built with proposed mitigation fully implemented.

In summary, the results of the assessment show that the project without considering proposed mitigation will have no changes to the 14 wetland functions, as capturable by the HGM assessment model. All the wetland functions are currently (existing conditions) functioning well below reference standards, remembering that this project site is outside the reference domain (south coast of Santa Barbara County). Regardless, DMEC believes that the Santa Barbara HGM reference sites are fairly representative of conditions of riparian streams in the Santa Monica Mountains. The proposed riparian enhancement (DMEC 1999) would improve most wetland functions slightly to significantly, depending on the function. Some functions cannot be improved with onsite restoration, primarily because they are based on the condition of the watershed entirely beyond the control of the Odyssey Program.

HGM Wetland Assessment of Existing Conditions

The HGM wetland assessment was conducted for the portion of Las Flores Canyon Creek within the Odyssey Program project site. Data sheets and calculations used for this HGM assessment are included as Appendix A.

Using the HGM rapid assessment methods described in the previous section, the project site portion of Las Flores Canyon Creek was found to be functioning significantly below reference standards for all of the fourteen wetland functions (Table 6, Baseline Wetland Function Index Scores). An Index Score of 1.0 represents the highest level existing for each function. Only Functions 12, Maintain habitat interspersion and connectivity, was found to be operating at 67 percent of reference standard levels. All other functions were scored below 60 percent.

Table 6. Baseline Wetland Function Index Scores

Wetland Function	Baseline Index	Function Description
1	0.33	Maintenance of characteristic channel dynamics
2	0.58	Dynamic surface water storage & energy dissipation
3	0.53	Long-term surface water storage
4	0.59	Dynamic subsurface water storage
5	0.39	Nutrient cycling
6	0.46	Detention of imported elements & components
7	0.59	Detention of particulates
8	0.36	Organic carbon export
9	0.54	Maintain characteristic plant community
10	0.28	Maintain characteristic detrital biomass
11	0.53	Maintain spatial structure of habitat
12	0.67	Maintain habitat interspersion & connectivity
13	0.45	Maintain taxa richness of aquatic macroinvertebrates
14	0.43	Maintain distribution and abundance of vertebrates
Average of all indices:	0.48	

Each of the wetland function index scores would be at 1.0 if no development of any kind were located within Las Flores Canyon. The fact that the canyon has been developed to some extent, but not entirely, is the reason the wetland functions are all lower than 1.0. It is these baseline index scores that are used to determine changes, if any, to each of the wetland functions as a result of building the Odyssey Program middle school.

The HGM assessment indicates that, in general, the wetlands associated with Las Flores Canyon Creek at the project site operates at levels well below the reference standards (existing conditions), based primarily on historic adverse anthropogenic changes to the assessment area (Las Flores Canyon). Notable conditions that caused downward scaling of individual functions from optimal levels were the:

- Presence of development upstream (mostly roads);
- Presence of development (road [Las Flores Canyon Road] alongside, and bridge over creek and highway [PCH], and development) downstream;
- Past hardscaping of the west bank of Las Flores Creek onsite (floodwall, rock riprap); and
- Presence of rural urban development in the canyon near the Odyssey Program project site.

Regardless, the assessment area was found to be providing significant wetland functions for all functions except Function 10, which was found to be functioning at only 0.28. All wetland functions except Function 12 were functioning below 60% of their potential and only seven (7 of the functions (Functions 2, 3, 4, 7, 9, 11, and 12) were functioning above 50% of the reference standards, with an average of the fourteen functional scores at 0.48.

This analysis illustrates the sensitivity of Environmentally Sensitive Habitat Areas (ESHAs), such as riparian habitats, to changes within and adjacent such habitats. Even with 100-foot buffer zones, changes beyond and upstream of an ESHA can have significant effects on wetland functions.

HGM Wetland Assessment of Post-Project Conditions

The 14 wetland functions were assessed of the site as if the middle school had been constructed. The level at which each wetland function is expected to operate at was considered without any habitat mitigation. The intent is to determine which wetland functions would be affected, and how much (on a relative basis) would the function indices change. Data sheets and calculations used for this HGM assessment are included as Appendix A.

The HGM model found that all 14 wetland functions were found to be functioning at the same levels for all functions upon build-out as with existing conditions. In other words, the proposed project would not change any of the wetland functions (Table 7, Post-Project Wetland Function Index Scores) (compared to Table 6).

Table 7. Post-Project Wetland Function Index Scores

Wetland Function	Post-Project Index	Function Description
1	0.33	Maintenance of characteristic channel dynamics
2	0.58	Dynamic surface water storage & energy dissipation
3	0.53	Long-term surface water storage
4	0.59	Dynamic subsurface water storage
5	0.39	Nutrient cycling
6	0.46	Detention of imported elements & components
7	0.59	Detention of particulates
8	0.36	Organic carbon export
9	0.54	Maintain characteristic plant community
10	0.28	Maintain characteristic detrital biomass
11	0.53	Maintain spatial structure of habitat
12	0.67	Maintain habitat interspersion & connectivity
13	0.45	Maintain taxa richness of aquatic macroinvertebrates
14	0.43	Maintain distribution and abundance of vertebrates
Average of all indices:	0.48	

The wetland functions of Las Flores Canyon Creek are not expected to change (as measured by the HGM model), primarily because no work is proposed within Las Flores Canyon Creek and existing conditions would not be changed enough to trigger changes in any of the 28 variables used to scale and measure the 14 functions. Regardless, DMEC expects the construction of a 5,500 square-foot (footprint) school building onsite to have at least some impacts on the environment, such as the removal of several California Sycamore trees. These changes just are not captured as significant changes in any of the HGM model variables or functions, in part because the trees to be removed are not shading the active stream channel. This is a matter of scale; that is the HGM model is not able to measure these small changes.

HGM Wetland Assessment After Mitigation

Since several California Sycamore trees and a small Coast Live Oak tree will be removed and the middle school will be constructed partially within the disturbed ESHA, the Odyssey Program proposes to enhance the riparian and wetland habitats of Las Flores Creek onsite to mitigate for any adverse impacts to existing wetland functions and changes to habitat within the ESHA.

The wetland functions were assessed on the site as if the middle school had been constructed and the proposed riparian enhancement mitigation (DMEC 1999) had been fully implemented (and after a period of five years, i.e. the monitoring period). The level at which each wetland function is expected to operate at was considered with habitat mitigation. The intent is to determine which wetland functions would be enhanced, and how much (on a relative basis) would the function indices improve to mitigate for project-related impacts to wetland functions within the disturbed ESHA onsite. Data sheets and calculations used for this HGM assessment are included as Appendix A.

The Odyssey Program portion of Las Flores Canyon Creek upon completion of build-out and mitigation was still found to be functioning below reference standards for all of the 14 wetland functions (Table 8, Comparison of Pre-, Post-, and Mitigated-Project Wetland Function Index Scores), similar to that for baseline conditions for most functions.

Table 8. Comparison of Pre-, Post-, and Mitigated-Project Wetland Function Index Scores

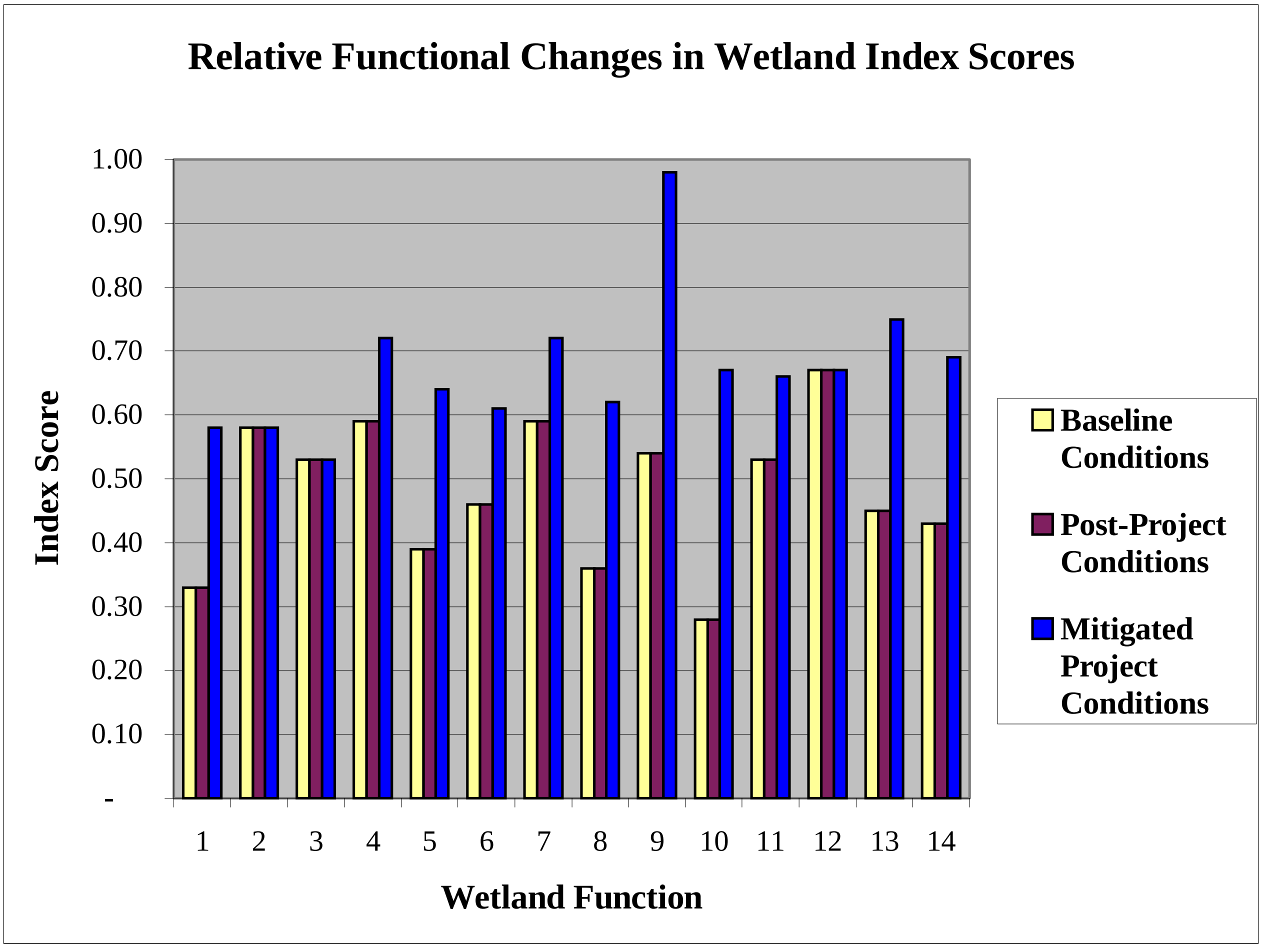
Wetland Function	Baseline Indices	Mitigated Project Indices	Rate of Change	Function Description
1	0.33	0.58	**0.25**	Maintenance of characteristic channel dynamics
2	0.58	0.58	0.00	Dynamic surface water storage & energy dissipation
3	0.53	0.53	0.00	Long-term surface water storage
4	0.59	0.72	0.13	Dynamic subsurface water storage
5	0.39	0.64	**0.25**	Nutrient cycling
6	0.46	0.61	0.15	Detention of imported elements & components
7	0.59	0.72	0.13	Detention of particulates
8	0.36	0.62	0.13	Organic carbon export
9	0.54	0.98	**0.44**	Maintain characteristic plant community
10	0.28	0.67	**0.39**	Maintain characteristic detrital biomass
11	0.53	0.66	0.12	Maintain spatial structure of habitat
12	0.67	0.67	0.00	Maintain habitat interspersion & connectivity
13	0.45	0.75	**0.30**	Maintain taxa richness of aquatic macroinvertebrates
14	0.43	0.69	**0.26**	Maintain distribution and abundance of vertebrates

Average rate of function change: 0.18

The rates of change shown in **bold** in Table 8 highlight those wetland functions that are expected to improve significantly after the proposed mitigation has reached maturity. Significant changes/improvements in the wetland functions is defined here as a 25% or greater improvement. The proposed mitigation will not change/improve three wetland functions (Functions 2, 3, and 12). However, Functions 1, 5, 9, 10, 13, and 14 will be improved significantly, with Function 9 almost being restored to reference standard level at 98 percent.

The chart attending Table 8 (below) graphically illustrates the wetland function indices for baseline (existing) conditions and compares them to projected post-project and mitigated project indices. Figure 4, Rate of Change Comparison Chart of Wetland Functions Between Baseline, Post-Project, and Mitigated Project Conditions, includes calculations between these three site scenarios for each wetland function, and illustrates the relative changes (in percent).

Figure 4. Rate of Change Comparison Chart of Wetland Functions Between Baseline, Post-Project, and Mitigated Project Conditions



The HGM wetland functional assessment model is intended to be used independently for each wetland function, without summing the index scores for the fourteen functions (Smith et al. 1995). Regardless, if a simple comparison of the percent increase in wetland functions (e.g. 20%) is made with the constructing of the middle school, plus the recommended wetland riparian restoration/enhancement (DMEC 1998), physical, chemical, and biological functions of the existing wetland riparian habitats would function 20 percent better. A comparison for each wetland function, as recommended by Smith et al. (1995), is described and assessed briefly below.

Some variables have greater importance to various wetland functions either because they are used as part of the measurement of many functions or because they are one of only two or three variables used in a function. The variables used repeatedly (i.e. more than six functions) include $V_{BUFFCOND}$, $V_{BUFFCONT}$, $V_{BUFFWIDTH}$, V_{HERBCC}, V_{INCWD}, V_{SED}, $V_{SHRUBCC}$, and V_{TREEBA} (see Table 5 for definitions of the variables).

The variables that have higher relative importance because they are one of only a few variables used to calculate wetland functions include: V_{DECOMP}, V_{INCWD}, $V_{LANDUSE}$, V_{OFFCWD}, $V_{PATCHAREA}$,

$V_{PATCHCONTIG}$, $V_{PATCHNUM}$, $V_{RESIDPOOL}$, V_{SED}, V_{SNAGS}, and $V_{SOILINT}$. The result is that changes to these variables have a greater affect on one or more of the wetland functions at a given site. For example, changes to the assessment area that significantly affect the Snags (V_{SNAGS}) in the assessment area will result in substantial changes in Functions 10 and 11, with less influences on Functions 13 and 14. Fortunately for the Odyssey Program project, no changes are expected to the Snags variable, which is scored as operating at 25% of reference standard level for both existing and post-project conditions. See the tables and charts in Appendix A for a comparison of expected changes in each wetland variable.

FUNCTION BY FUNCTION ASSESSMENT

Below is a discussion of the expected changes and reasons for the changes for each of the 14 wetland functions.

Function 1 - Maintenance of Characteristic Channel Dynamics

This function captures the physical processes and structural attributes that maintain characteristic channel dynamics. These include: condition of the buffer zone adjacent to the creek, water flow characteristics, bedload, downed and dead branches and stems, channel dimensions, and other features, such as vegetation cover. Eight variables are used to capture this function and include: Buffer Condition ($V_{BUFFCOND}$), Buffer Contiguity ($V_{BUFFCONT}$), Buffer Width ($V_{BUFFWIDTH}$), Channel Roughness ($V_{CHANROUGH}$), Herbaceous Cover (V_{HERBCC}), In-channel Coarse Woody Debris (V_{INCWD}), Shrub Canopy Cover ($V_{SHRUBCC}$), and Basal Area of Trees (V_{TREEBA}) (Lee et al. 2001).

The proposed project-related wetland mitigation is expected to increase the functionality of maintaining characteristic channel dynamics from and index score of 0.33 to 0.58, or by 25% (see Table 8 and Figure 4), as a result of projected improvements by increasing the number of trees and modifying the herbaceous vegetation cover in the channel. In other words, simply by planting numerous trees along the bank of Las Flores Canyon Creek will improve channel dynamics of the site directly and indirectly.

Function 2 - Dynamic Surface Water Storage and Energy Dissipation

Function 2 captures the assessment area’s dynamic surface water storage and dissipation of energy at bankfull and greater discharges, which are a function of channel characteristics, off-channel sediment inputs, and the integrity of the soil profile. Three variables are used to measure this function: Residual Pools ($V_{RESIDPOOL}$), Sediment (V_{SED}), and Soil Integrity ($V_{SOILINT}$).

The proposed project is not expected to change (increase or decrease) the wetland’s dynamic surface water storage and energy dissipation capabilities from an index score of 0.58 (see Table 8 and Figure 4). This is because no work will be conducted in the creek bed and no changes to sediment inputs, distribution of pools, or the soil profile will occur. Efforts to change any of these variables would be prohibitively expensive and may also result in temporal impacts to them during implementation. Furthermore, since the proposed project is not expected to adversely affect this wetland function, or its variables, mitigation is not warranted or recommended.

Function 3 - Long-term Surface Water Storage

Function 3 measures a wetlands capability to temporarily store (retain) surface water for long durations (one or more days); associated with standing water not moving over the surface. Water sources may be overbank flow, overland flow or channelized flow from uplands, or direct precipitation. Ten variables are used to capture this wetland function: Buffer Condition ($V_{BUFFCOND}$), Buffer Contiguity ($V_{BUFFCONT}$), Buffer Width ($V_{BUFFWIDTH}$), Channel Roughness ($V_{CHANROUGH}$), Embeddedness of Large Channel Materials (V_{EMBED}), Land Use ($V_{LANDUSE}$), Longitudinal Profile integrity ($V_{LONGPROF}$), Sediment Deposition (V_{SED}), Soil Profile Integrity ($V_{SOILINT}$), and Surface Water In[puts] (V_{SURFIN}) (Lee et al. 2001).

Like for Function 2, no changes are expected for this function or any of its variables even with mitigation (see Table 8 and Figure 4). This is because no work will be conducted in the creek bed and no changes to sediment inputs, the width and condition of the buffer zone, changes in land use, or changes to the soil profile will occur. Furthermore, since the proposed project is not expected to adversely affect this wetland function, or its variables, mitigation is not warranted or recommended.

Function 4 - Dynamic Subsurface Water Storage

Function 4 captures the availability of water storage beneath the wetland surface, with capacity becoming available after periodic drawdown of the water table. Nine variables are used to measure this function: Buffer Condition ($V_{BUFFCOND}$), Buffer Contiguity ($V_{BUFFCONT}$), Buffer Width ($V_{BUFFWIDTH}$), Channel Roughness ($V_{CHANROUGH}$), Embeddedness of Large Channel Materials (V_{EMBED}), Herbaceous Cover (V_{HERBCC}), Sediment Deposition (V_{SED}), Shrub Canopy Cover ($V_{SHRUBCC}$), and Basal Area of Trees (V_{TREEBA}) (Lee et al. 2001).

The proposed project is modeled to increase the dynamic subsurface water storage capacity of the wetland area from and index score of 0.59 to 0.72, or by 13% (Table 8 and Figure 4), resulting from improvements in herbaceous, shrub, and tree canopy cover over baseline conditions. In other words, planting numerous trees and vines on the banks and subsequently reducing the relative cover of shrubs and herbs will move this wetland function closer (by 13 percent) to reference standard (optimal) conditions.

Function 5 - Nutrient Cycling

Function 5 measures (indirectly) the abiotic and biotic processes that convert elements from one form to another, primarily recycling processes. Since these processes can be complex and not easily measured in the field, the model uses eleven variables to capture the nutrient cycling function, including: Buffer Condition ($V_{BUFFCOND}$), Buffer Contiguity ($V_{BUFFCONT}$), Buffer Width ($V_{BUFFWIDTH}$), Decomposition (V_{DECOMP}), Herbaceous Cover (V_{HERBCC}), In-channel Coarse Woody

Debris (V_{INCWD}), Off-channel Coarse Woody Debris (V_{OFFCWD}), Sediment Deposition (V_{SED}), Shrub Canopy Cover ($V_{SHRUBCC}$), Soil Profile Integrity ($V_{SOILINT}$), and Basal Area of Trees (V_{TREEBA}) (Lee et al. 2001).

The proposed project is expected to increase the wetland's ability to recycle nutrients from an index score of 0.39 to 0.64, or by 25% (Table 8 and Figure 4). This is a result of: anticipated increases in the amount of soil organic matter allowed to accumulate onsite; of coarse woody debris that will be allowed to accumulate; changes to herbaceous plant cover; and, increases in the number of trees to be planted onsite.

Function 6 - Detention of Imported Elements and Compounds

Function 6 identifies a site's ability to detain imported nutrients, contaminants, and other elements or compounds present in the environment. Nine variables are used for this function: Buffer Condition ($V_{BUFFCOND}$), Buffer Contiguity ($V_{BUFFCONT}$), Buffer Width ($V_{BUFFWIDTH}$), Herbaceous Cover (V_{HERBCC}), Longitudinal Profile integrity ($V_{LONGPROF}$), Sediment Deposition (V_{SED}), Shrub Canopy Cover ($V_{SHRUBCC}$), Soil Profile Integrity ($V_{SOILINT}$), and Basal Area of Trees (V_{TREEBA}) (Lee et al. 2001).

The proposed project is modeled to increase the project site's ability to detain imported elements and compounds onsite from an index score of 0.46 to 0.61, or by 15% (Table 8 and Figure 4), as a result of anticipated increases in tree canopy cover and modifications of shrub and herbaceous plant cover.

Function 7 - Detention of Particulates

Function 7 gauges the deposition and detention of inorganic and organic particulates greater than 0.45μm from the water column, primarily through physical processes. This is done by using the same nine variables used for Function 4. See the discussion under Function 4 above for further analysis.

Function 8 - Organic Carbon Export

Function 8 captures a wetland's ability to export dissolved and particulate organic carbon from the wetland through mechanisms including leaching, flushing, displacement, and erosion. This function is measured through nine variables: Buffer Condition ($V_{BUFFCOND}$), Buffer Contiguity ($V_{BUFFCONT}$), Buffer Width ($V_{BUFFWIDTH}$), Decomposition (V_{DECOMP}), Herbaceous Cover (V_{HERBCC}), In-channel Coarse Woody Debris (V_{INCWD}), Longitudinal Profile integrity ($V_{LONGPROF}$), Shrub Canopy Cover ($V_{SHRUBCC}$), and Basal Area of Trees (V_{TREEBA}) (Lee et al. 2001).

The proposed project mitigation will increase the project site's ability to detain imported elements and compounds onsite, from an index score of 0.36 to 0.62, or by 13% (Table 8 and Figure 4). This is primarily as a result of expected increases in the amount of decomposing woody debris (natural downed and dead trunks, branches, and twigs), and trees onsite, as well as general changes in the natural vegetation in the assessment area wetlands.

Function 9 - Maintain Characteristic Plant Community

Function 9 measures the species composition and physical characteristics of living plant biomass, with emphasis on the dynamics and structure of the plant community as revealed by the species of trees, shrubs, seedlings, saplings, and herbs, and by the physical characteristics of the vegetation. The model uses eight variables to capture this function: Herbaceous Cover (V_{HERBCC}), Ratio of Native to Nonnative Dominant Plants (V_{RATIO}), Capacity of Site Regeneration (V_{REGEN}), Shrub Canopy Cover ($V_{SHRUBCC}$), Vegetation Strata Over Channel (V_{STRATA}), Basal Area of Trees (V_{TREEBA}), Tree Canopy Cover (V_{TREECC}), and Vine Canopy Cover (V_{VINECC}) (Lee et al. 2001).

The proposed project is anticipated to increase the project site's ability to maintain characteristic plant communities onsite from an index score of 0.54 to 0.98, or by 44% (Table 8 and Figure 4). This is primarily as a result of increases in the improvements in herbaceous and shrub cover in the channel, improvements in the ratio of native to nonnative plant species, increases in the number of vines, and increases in the number of trees onsite.

Function 10 - Maintain Characteristic Detrital Biomass

Function 10 gauges the process of production, accumulation, and dispersal of dead plant biomass of all sizes, from onsite or upslope and upgradient sources. Four variables are used for this function: Decomposition (V_{DECOMP}), In-channel Coarse Woody Debris (V_{INCWD}), Off-channel Coarse Woody Debris (V_{OFFCWD}), and Snags (V_{SNAGS}) (Lee et al. 2001).

The proposed project is anticipated to increase the project site's ability to maintain characteristic detrital biomass onsite from an index score of 0.28 to 0.67, or by 39% (Table 8 and Figure 4), as a result of anticipated increases to the amount of fine and coarse woody debris that will be allowed to accumulate in the assessment area wetlands. The Coast Live Oak and California Sycamore trees that are required to be removed to make way for the middle school building will be placed strategically on the banks of Las Flores Canyon Creek to supplement onsite tree snags and coarse woody debris available for wildlife and wetland processes.

Function 11 - Maintain Spatial Structure of Habitat

Function 11 captures the capacity of a wetland to support animal populations and guilds by providing heterogeneous habitats. Eight variables are used to measure this function: Animal Signs (V_{ASIGN}), Buffer Condition ($V_{BUFFCOND}$), Buffer Contiguity ($V_{BUFFCONT}$), Buffer Width ($V_{BUFFWIDTH}$), Residual Pools ($V_{RESIDPOOL}$), Shade (V_{SHADE}), Snags (V_{SNAGS}), and Strata (V_{STRATA}) (Lee et al. 2001).

The proposed project is anticipated to increase the project site's ability to maintain spatial structure of habitat onsite from an index score of 0.53 to 0.66, or by 12% (Table 8 and Figure 4).

This is accomplished primarily as a result of anticipated increases in amounts of shade over the channel through planting trees, and adding snags and structural diversity to the creek.

Function 12 - Maintain Habitat Interspersion and Connectivity

Function 12 is intended to capture the capacity of the wetland to permit access of terrestrial or aerial organisms to contiguous areas of food and cover, and is measured through four variables: Land Use ($V_{LANDUSE}$), Area of [habitat] Patches ($V_{PATCHAREA}$), Contiguity of [habitat] Patches ($V_{PATCHCONTIG}$), and Number of [habitat] Patches ($V_{PATCHNUM}$) (Lee et al. 2001).

The proposed project not is anticipated to increase the project site's ability to maintain habitat interspersion and connectivity onsite from an index score of 0.67 (Table 8 and Figure 4), even with improving tree canopy cover and habitat diversity (snags, coarse woody debris, vegetation strata) in the assessment area wetlands. This is primarily the case since the variables used for this wetland function assess habitat conditions well beyond the project site and is independent of onsite actions or conditions.

Function 13 - Maintain Taxa Richness of Aquatic Macroinvertebrates

Function 13 measures the species richness and diversity of macroinvertebrates in Las Flores Canyon Creek. Lee et al. (2001) declined to develop an index formula for this function because they felt that they could not develop a method for the average user to rapidly measure this function. However, DMEC believes that use of many of the variables already developed for this model can reasonably capture this function, at least indirectly. DMEC herein uses eighteen of the twenty-eight variables to capture this function: Animal Signs (V_{ASIGN}), Buffer Condition ($V_{BUFFCOND}$), Buffer Contiguity ($V_{BUFFCONT}$), Buffer Width ($V_{BUFFWIDTH}$), Herbaceous Cover (V_{HERBCC}), In-channel Coarse Woody Debris (V_{INCWD}), Land Use ($V_{LANDUSE}$), Off-channel Coarse Woody Debris (V_{OFFCWD}), Area of [habitat] Patches ($V_{PATCHAREA}$), Contiguity of [habitat] Patches ($V_{PATCHCONTIG}$), and Number of [habitat] Patches ($V_{PATCHNUM}$), Ratio of Native to Nonnative Dominant Plants (V_{RATIO}), Capacity of Site Regeneration (V_{REGEN}), Residual Pools ($V_{RESIDPOOL}$), Shrub Canopy Cover ($V_{SHRUBCC}$), Snags (V_{SNAGS}), Vegetation Strata Over Channel (V_{STRATA}), Tree Canopy Cover (V_{TREECC}), and Vine Canopy Cover (V_{VINECC}).

The proposed project is anticipated to increase the project site's ability to maintain taxa richness of aquatic macroinvertebrates onsite from an index score of 0.45 to 0.75, or by an increase of 30% (Table 8 and Figure 4). This would be accomplished indirectly by improving conditions for aquatic invertebrates onsite by improving tree canopy cover and habitat diversity (snags, coarse woody debris, vegetation strata) in the assessment area wetlands, which should increase habitat niches and the food sources for many species of invertebrates.

Function 14 - Maintain Distribution and Abundance of Vertebrates

Function 14 measures the species distribution and abundance of vertebrates in Las Flores Canyon Creek. Lee et al. (2001) declined to develop an index formula for this function because they felt that they could not develop a method for the average user to rapidly measure this function. However, DMEC believes that use of many of the variables already developed for this model can reasonably capture this function, at least indirectly. DMEC herein uses twenty-two of the twenty-eight variables to capture this function: Animal Signs (V_{ASIGN}), Buffer Condition ($V_{BUFFCOND}$), Buffer Contiguity ($V_{BUFFCONT}$), Buffer Width ($V_{BUFFWIDTH}$), Channel Roughness ($V_{CHANROUGH}$), Decomposition (V_{DECOMP}), Herbaceous Cover (V_{HERBCC}), In-channel Coarse Woody Debris (V_{INCWD}), Land Use ($V_{LANDUSE}$), Longitudinal Profile integrity ($V_{LONGPROF}$), Off-channel Coarse Woody Debris (V_{OFFCWD}), Area of [habitat] Patches ($V_{PATCHAREA}$), Contiguity of [habitat] Patches ($V_{PATCHCONTIG}$), and Number of [habitat] Patches ($V_{PATCHNUM}$), Capacity of Site Regeneration (V_{REGEN}), Residual Pools ($V_{RESIDPOOL}$), Shrub Canopy Cover ($V_{SHRUBCC}$), Snags (V_{SNAGS}), Soil Profile Integrity ($V_{SOILINT}$), Vegetation Strata Over Channel (V_{STRATA}), Tree Canopy Cover (V_{TREECC}), and Vine Canopy Cover (V_{VINECC}).

The proposed project is anticipated to increase the project site's ability to maintain distribution and abundance of vertebrates onsite from an index score of 0.43 to 0.69, or by an increase of 26% (Table 8 and Figure 4). This would be accomplished indirectly by improving conditions for aquatic invertebrates onsite by improving tree canopy cover and habitat diversity (snags, coarse woody debris, vegetation strata) in the assessment area wetlands, which should increase habitat niches and the food sources for many species of vertebrates.

CONCLUSIONS

DMEC concludes through the assessment that the proposed project would not cause measurable changes to any of the 14 wetland functions provided by riverine wetland ecosystems. DMEC further concludes that the proposed wetland restoration and mitigation plan for the Odyssey Program Middle School (formerly the Carden Malibu School) project (DMEC 1999), if implemented, will increase 11 of the wetland functions onsite over baseline ("existing") conditions. Three of the wetland functions (Functions 2, 3, and 12) cannot be improved through onsite restoration.

As illustrated in Figure 4, six of the fourteen wetland functions would be improved significantly from baseline conditions if the proposed wetland restoration plan (DMEC 1999) is implemented. (A significant improvement is defined here as a positive change of a function by at least 25%, which is to err on the conservative side.) All functions are expected to increase except Functions 2, 3, and 12, as a result of the proposed mitigation, by at least 12% (Function 11) and as much as 44 percent (Function 9). The fourteen wetland functions would be improved, on average, by 18% (see Table 8); however, averaging the tallies for the fourteen functions together is not an intended use of the HGM model, and should be considered accordingly, which is to compare changes in wetland functions on a function by function basis. The three functions that would not be increased significantly (Functions 2, 3, and 12) would not increase in function.

The Odyssey Program is constrained in his ability to change existing conditions offsite that would be required to significantly improve all wetland functions, especially Functions 2, 3, and 12.

DMEC believes that this wetland assessment demonstrates numerically that the proposed wetland mitigation will provide better wetland habitat than existed previously. In addition, the wetland mitigation site will be preserved in perpetuity, which is not the case presently.

DMEC

ACKNOWLEDGEMENTS

This report was written by David Magney. Mr. Magney and Ms. Cher Batchelor performed the onsite functional assessment. Mr. Magney prepared the figures and tables and Ms. Batchelor produced the report.

Mr. Steve Mecham, of the Odyssey Program, and Mr. Alan Armstrong, property owner, provided information about the project site history and details about the proposed project.

DMEC

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APPENDIX A

FUNCTIONAL ASSESSMENT WORKSHEETS AND GRAPHS FOR PRE-, POST-, AND MITIGATED-PROJECT CONDITIONS

Project Name: **Odyssey Program Middle School**
Project Site: **Middle School Site, Las Flores Canyon**
Assessor/Observer: **David L. Magney & Cher Batchelor**
Project Phase: **Baseline (Existing) Conditions**

Date: **14 December 2001**
County: **Los Angeles**
City: **Malibu**

	South Santa Barbara Coast Streams													
Variable	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
Vasign											0.75		0.75	0.75
Vbuffcond	0.25		0.25	0.25	0.25	0.25	0.25	0.25			0.25		0.25	0.25
Vbuffcont	0.50		0.50	0.50	0.50	0.50	0.50	0.50			0.50		0.50	0.50
Vbuffwidth	0.50		0.50	0.50	0.50	0.50	0.50	0.50			0.50		0.50	0.50
Vchanrough	0.50		0.50	0.50			0.50							0.50
Vdecomp					0.5			0.50		0.50				0.50
Vembed			1.00	1.00			1.00							
Vherbcc	0.25			0.25	0.25	0.25	0.25	0.25	0.25				0.25	0.25
Vincwd	0.10				0.10			0.10		0.10			0.10	0.10
Vlanduse			0.50									0.50	0.50	0.50
Vlongprof			0.50			0.50		0.50						0.50
Voffcwd					0.10					0.10			0.10	0.10
Vpatcharea												0.75	0.75	0.75
Vpatchcontig												1.00	1.00	1.00
Vpatchnum												0.75	0.75	0.75
Vratio									1.00				1.00	
Vregen									0.25				0.25	0.25
Vresidpool		0.50									0.50		0.50	0.50
Vsed		0.75	0.75	0.75	0.75	0.75	0.75							
Vshade											0.25			
Vshrubcc	0.50			0.50	0.50	0.50	0.50	0.50	0.50				0.50	0.50
Vsnags										0.25	0.25		0.25	0.25
Vsoilint		0.50	0.50		0.50	0.50								0.50
Vstrata									0.75		0.75		0.75	0.75
Vsurfin			0.75											
Vtreeba	0.10			0.10	0.10	0.10	0.10	0.10	0.10					
Vtreecc									0.25				0.25	0.25
Vvinecc									0.25				0.25	0.25

Project Name: **Odyssey Program Middle School** Date: **14 December 2001**

Project Site: **Middle School Site, Las Flores Canyon** County: **Los Angeles**

Assessor/Observer: **David L. Magney & Cher Batchelor** City: **Malibu**

Project Phase: **Project Conditions (w/school building constructed w/o mitigation)**

	South Santa Barbara Coast Streams													
Variable	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
Vasign											0.75		0.75	0.75
Vbuffcond	0.25		0.25	0.25	0.25	0.25	0.25	0.25			0.25		0.25	0.25
Vbuffcont	0.50		0.50	0.50	0.50	0.50	0.50	0.50			0.50		0.50	0.50
Vbuffwidth	0.50		0.50	0.50	0.50	0.50	0.50	0.50			0.50		0.50	0.50
Vchanrough	0.50		0.50	0.50			0.50							0.50
Vdecomp					0.50			0.50		0.50				0.50
Vembed			1.00	1.00			1.00							
Vherbcc	0.25			0.25	0.25	0.25	0.25	0.25	0.25				0.25	0.25
Vincwd	0.10				0.10			0.10		0.10			0.10	0.10
Vlanduse			0.50									0.50	0.50	0.50
Vlongprof			0.50			0.50		0.50						0.50
Voffcwd					0.10					0.10			0.10	0.10
Vpatcharea												0.75	0.75	0.75
Vpatchcontig												1.00	1.00	1.00
Vpatchnum												0.75	0.75	0.75
Vratio									1.00				1.00	
Vregen									0.25				0.25	0.25
Vresidpool		0.50									0.50		0.50	0.50
Vsed		0.75	0.75	0.75	0.75	0.75	0.75							
Vshade											0.25			
Vshrubcc	0.50			0.50	0.50	0.50	0.50	0.50	0.50				0.50	0.50
Vsnags										0.25	0.25		0.25	0.25
Vsoilint		0.50	0.50		0.50	0.50								0.50
Vstrata									0.75		0.75		0.75	0.75
Vsurfin			0.75											
Vtreeba	0.10			0.10	0.10	0.10	0.10	0.10	0.10					
Vtreecc									0.25				0.25	0.25
Vvinecc									0.25				0.25	0.25

DMEC

Project Name: **Odyssey Program Middle School**

Project Site: **Middle School Site, Las Flores Canyon**

Assessor/Observer: **David L. Magney & Cher Batchelor**

Project Phase: **Post-Project Mitigated Conditions**

Date: **14 December 2001**

County: **Los Angeles**

City: **Malibu**

Variable	South Santa Barbara Coast Streams													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Vasign											0.75		0.75	0.75
Vbuffcond	0.25		0.25	0.25	0.25	0.25	0.25	0.25			0.25		0.25	0.25
Vbuffcont	0.50		0.50	0.50	0.50	0.50	0.50	0.50			0.50		0.50	0.50
Vbuffwidth	0.50		0.50	0.50	0.50	0.50	0.50	0.50			0.50		0.50	0.50
Vchanrough	0.50		0.50	0.50			0.50							0.50
Vdecomp					0.75			0.75		0.75				0.75
Vembed			1.00	1.00			1.00							
Vherbcc	1.00			1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00
Vincwd	0.50				0.50			0.50		0.50			0.50	0.50
Vlanduse			0.50									0.50	0.50	0.50
Vlongprof			0.50			0.50		0.50						0.50
Voffcwd					0.50					0.50			0.50	0.50
Vpatcharea												0.75	0.75	0.75
Vpatchcontig												1.00	1.00	1.00
Vpatchnum												0.75	0.75	0.75
Vratio									1.00				1.00	
Vregen									1.00				1.00	1.00
Vresidpool		0.50									0.50		0.50	0.50
Vsed		0.75	0.75	0.75	0.75	0.75	0.75							
Vshade											1.00			
Vshrubcc	0.75			0.75	0.75	0.75	0.75	0.75	0.75				0.75	0.75
Vsnags										0.75	0.75		0.75	0.75
Vsoilint		0.50	0.50		0.50	0.50								0.50
Vstrata									1.00		1.00		1.00	1.00
Vsurfin			0.75											
Vtreeba	1.00			1.00	1.00	1.00	1.00	1.00	1.00					
Vtreecc									0.75				0.75	0.75
Vvinecc									1.00				1.00	1.00