From: george rittenhouse [mailto:gritten661@earthlink.net]
Sent: Sat 4/28/2007 11:30 AM
To: Laveaga, Rosa
Subject: MACH 1 Road Letter

Hi Rosa,

This is what I hope got sent to all council members and the Mayor.

Re: Hahamongna Watershed Park Annex

Dear Ladies and Gentlemen,

On behalf of Move A Child Higher, Inc. (MACH 1), I am grateful that it is to be considered part of the plan for the Hahamongna Watershed Park Annex. My wife's therapeutic horseback riding program for the disabled has been serving the City of Pasadena and the San Gabriel Valley for more than ten years. Moving to the property designated in the plan will allow her to provide her service to more people and under better conditions, conditions that will not impinge on others.

The new location has a parking area assigned to it. We are assured that the parking area will be handicapped accessible, consistent with the needs of MACH 1 clientele. Under the existing plan, all would seem sufficient.

I understand, however, that there is opposition to the 800' road extension to a proposed JPL parking area at the northern edge of what is now the Rose Bowl Riding Club facility. Without the road, the parking planned for that area will be forgone and the ability to maneuver vehicles – particularly larger vehicles like fire engines and busses - will be limited.

The plans for public Annex usage and the exciting expansion of Rose Bowl Riding facility usage to include more trainers, riding clinics, and other equestrian activities open to the public will require more parking area. Without weekend use of the JPL lot, I am afraid people will use the areas designated for MACH 1 use, resulting in a severe inconvenience to our students, many of whom are in wheelchairs or can only walk with difficulty.

Moreover, my service as a volunteer chaplain with the Pasadena Police Department has made me sensitive to law enforcement and emergency issues. As much as we would like to preserve the natural assets of the area, the presence of the public requires that we think in terms of security and accessibility to fire and emergency vehicles and personnel. We are all aware of the gang graffiti, vandalism and other evidence of potential problems. Increased public presence will only increase this potential. While not a lawyer, I would think that deliberately limiting access to the area might raise the possibility of liability in the event of an emergency. I haven't heard any of this discussed at the various meetings I have attended.

The City of Pasadena has decided to use the Hahamongna Watershed Park Annex for the enrichment of the people of Pasadena in a variety of exciting ways, and certainly we are glad to be a part of it. It promises to be a valuable addition to the Pasadena experience. Let's keep it a safe one as well. Please keep the road.

Very truly yours,

Rev. George E. Rittenhouse
1430 Topeka Street
Pasadena, CA 91104
April 27, 2007

04/30/2007
7.A.1.

Rodriguez, Jane

Sent: Monday, April 30, 2007 12:42 PM
To: Rodriguez, Jane
Subject: FW: Additional Public Comment on Proposed Hahamongna Annex/Open Space Use
Importance: High
Attachments: Pasadena Tenant.doc

Hi Jane,

Please print this letter and attachments and provide a copy to each council member and mayor for tonight's meeting.

There are just the two comments and emails, I thought three. This will be all that we are sending. Please don't forget to include the attachments.

THANK YOU!

Leeona Klippstein, Executive Director
Spirit of the Sage Council

leeona@earthlink.net

----- Original Message -----
From:
To: bbogaard@ci.pasadena.ca.us;smadison@ci.pasadena.ca.us;jstreator@ci.pasadena.ca.us;plittle@ci.pasadena.c
Cc: Hugh Bowles; Hugh Bowles; shermanlaw@aol.com
Sent: 4/30/2007 3:09:28 PM
Subject: Public Comment on Proposed Hahamongna Annex/Open Space Use

Mayor and City Council
City of Pasadena
117 East Colorado Blvd.
Pasadena, CA 91105 VIA E-Mail to Mayor and each Member

April 30, 2007

RE: Additional Comments on Proposed New Development of Open Space Annex Area of the Hahamongna Watershed Park - Proposed Hahamongna Annex/Open Space Tenants

Honorable Mayor Borgaard and City Council Members,

Spirit of the Sage Council has submitted previous comments, dated April 29, 2007. This letter is a continuation of those.

Upon reading the staff report for the City's proposed "conceptual" uses and goals, we were surprised to see a Tenant's Question Outline and letters from various groups that are requesting to be tenant's (Exhibit 4). Spirit of the Sage Council was not notified of a process in which our

nonprofit could participate. We are assuming that all we need to do is ask and answer the questions. Our answers are attached for your review and approval.

We believe that there is enough office and classroom space available for Pasadena City College's Environmental Program and the other nonprofits, including Spirit of the Sage Council. We only need two rooms inside the former U.S. Forest Service building.

As you are aware, Spirit of the Sage Council has supporters that reside near the Arroyo Seco and have actively voiced their concerns over the needed conservation of the area. Our organization is a recognized expert on habitat conservation planning. We have contacts within U.S. Fish and Wildlife Service and the California Department of Fish & Game. We created a sister organization and land trust, The Habitat Trust for Wildlife, that currently owns and manages over 500-habitat acres in Western San Bernardino County.

The Sage Council and Habitat Trust are willing to provide guidance in the restoration of Hahamongna. Our knowledge of native plants of the Arroyo Seco, including environmental regulations could be a great benefit. In addition, we are willing to actively raise funds through our past grant makers.

The staff report, for tonight's City Council hearing, also includes "Goals" and recommended amendments to previously approved Goals in the ASMP MEIR. Many of the conservation related goals, the Sage Council can support. However, some existing and proposed are contrary to each other i.e. conservation of oak woodlands and water recharge vs. roads and parking lots. As previously stated, the Sage Council does not support new roads, road expansions/improvements and new parking lots. Any disturbed habitat areas in the Annex/Open Space area should be restored, not paved over.

The City has a real opportunity to be a conservation leader. Not only of habitat and water, but for energy conservation. Let's make the Annex area an example within the State. Let's use solar panels as energy for the classrooms and offices. Let's get a biofuel or electric vehicle that is used for carpooling of PCC students. Let's take the use of the Annex area one step further than what is currently being proposed. The proposed roads and parking lots are an outdated way of thinking and planning. The Sage Council is known for our cutting-edge conservation tactics that push the envelope. We can make the Annex/Open Space an example of how local government and nonprofit conservation groups can work together for the Earth. I'm sure we could get the Governor, our grant makers and some celebrities to support this sort of use. We are willing if you are.

Sincerely,

Leeona Klippstein, Executive Director
Spirit of the Sage Council
30 North Raymond Ave., Suite 303
Pasadena, CA 91103
(626) 676-4116

leeona@earthlink.net

Mayor and City Council
City of Pasadena
117 East Colorado Blvd.
Pasadena, CA 91105

VIA E-Mail to Mayor and each Member

April 30, 2007

RE: Comment on Proposed New Development of Open Space Annex Area of the Hahamongna Watershed Park - Proposed Hahamongna Annex/Open Space Tenants

Spirit of the Sage Council requests consideration and inclusion as a TENANT of the former U.S. Forest Service Building. Below is our response to the City's Tenant Questionnaire (Exhibit 4)

MISSION – To defend and conserve native plants, fish, wildlife and cultural lands.

BACKGROUND – Co-founded by Gabrielino Chief Ya'nna, Vera Rocha, her husband and Spiritual leader, Manual Rocha, and Environmental Activist, Leeona Klippstein in 1991. Spirit of the Sage Council was created in order to conserve lands of biological and cultural significance that are threatened by proposed development, government policy and other human activities. In 1991, scientists, natural resource agencies and the State identified that Coastal Sage Scrub (CSS) Natural Communities were very threatened by development in Southern California. One songbird species, the California gnatcatcher, was identified and proposed for listing under the federal Endangered Species Act. Scientists referred to the gnatcatcher as an "indicator" species for the CSS natural community, habitat to over 100 rare, threatened and endangered species. Although the biological importance of CSS was recognized, the ethnobotanical, or cultural importances, of the sage lands were not. This is where Spirit of the Sage Council became a participant in the government decision making process.

Many of the native plants have medicinal and sacred ceremonial properties that are vital to the culture of the indigenous Shoshone Gabrielino (Gabrielino Band of California Mission Indians) tribe. This is also what led to the name of our organization, by Vera and Manual Rocha. "It is the Sage that is endangered and it is the Sage that keeps our people healthy and strong. It is the Spirit of the Sage that is calling us together in council. We are Spirit of the Sage Council."

LOCATION - Leeona Klippstein and Mary Knight have leased the Pasadena office (Scandia Bldg., 30 N. Raymond Ave., Suite 303) on behalf of Spirit of the Sage Council for nearly ten years.

PUBLIC BENEFITS – Spirit of the Sage Council has enforced environmental laws that have led to the permanent conservation of nearly 3000-acres of imperiled habitats that where threatened by development, including the Upper Arroyo Seco. We work with

citizens and community groups that desire to protect their quality of life through the conservation of nature. We assist in the formation and organization of community watchdog groups, teach public participation in government decision making, fund raising and assist in finding expert legal representation. We have been invited speakers at schools, universities, law conferences and before members of the U.S. House of Representatives. In addition, we have been a member of Advisory Committees for the County of Riverside and San Bernardino Habitat Conservation Planning. Spirit of the Sage Council is a national environmental leader and expert on the implementation of Habitat Conservation Planning and Policy, subject to the federal Endangered Species Act (ESA). Our ongoing legal challenge to U.S. Department of Interior's regulatory changes to the ESA, known as No Surprises Assurances, has brought national attention to the threats to the recovery needs of over 850 various species on 139,000,000-habitat acres. Through conservation of habitats, our works also reduces Global Warming.

SERVICE AREA – Spirit of the Sage Council serves millions of Americans that believe the protection of the Earth and environment are a priority. Like the LORAX, we give voice to the voiceless animals and plants whose habitat homes are threatened by ignorance and greed of humans. Our focus issues and areas in Southern California include;

- Arroyo Seco – Hahamongna area - Pasadena
- Ballona Wetlands and West Bluffs, Los Angeles
- Cucamongna Canyon, Rancho Cucamonga
- North Etiwanda Alluvial Fan, Rancho Cucamonga
- Lytle Creek, San Bernardino
- Natural Communities Conservation Planning Program Areas and Habitat Conservation Plans – throughout California and United States
- Longleaf Pine ecosystem – Sandhills region of North Carolina

FEES – Spirit of the Sage Council requests donations, not fees. Donations can be of any amount, including service related.

REVENUE – Funding of our conservation projects is provided by environmental grant makers, the public, online auctions, fundraising events and legal awards.

MEMBERSHIP QUALIFICATION - Any member of the public can become a member/supporter of the Sage Council. Only requirement is that they make conservation a priority with our projects. Our board of directors and executive director selects conservation projects and how they are implemented. Member/supporters may participate on a Project Committee to advise and assist in the implementation of conservation projects.

CITY FEES – We do not have any City Fees or currently use any City owned properties for our office.

FACILITIES – We lease an office at the Scandia Building in Old Town Pasadena. We rent office space in Carthage, North Carolina.

OTHER ORGANIZATIONS - There are no other public benefit conservation organizations known of, with offices in Pasadena, have the experience or provide the same services as Spirit of the Sage Council.

GROWTH TREND – Spirit of the Sage Council has continued to grow every year, especially in regards to national support on endangered species policy related issues. Five years ago we opened an office in the Southeast that we may be of better assistance to our supporters in that region of the United States. In 2000, we created a nonprofit land trust, The Habitat Trust for Wildlife. Due to the success of the Sage Council's conservation work we formed the land trust so that we could accept land donations and habitat mitigation areas.

FUTURE – The future looks bright for the Sage Council. We anticipate conserving more habitat lands and receiving additional funding support from grant makers and the public. In 5-10 years, we foresee having more staff and scientific advisors to address additional conservation projects, including those specific to Global Warming.

Rodriguez, Jane

Sent: Monday, April 30, 2007 12:42 PM
To: Rodriguez, Jane
Subject: FW: Additional Public Comment on Proposed Hahamongna Annex/Open Space Use
Importance: High
Attachments: Pasadena Tenant.doc

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THANK YOU!

Leeona Klippstein, Executive Director
Spirit of the Sage Council

leeona@earthlink.net

----- Original Message -----
From:
To: bbogaard@ci.pasadena.ca.us;smadison@ci.pasadena.ca.us;jstreator@ci.pasadena.ca.us;plittle@ci.pasadena.c
Cc: Hugh Bowles; Hugh Bowles; shermanlaw@aol.com
Sent: 4/30/2007 3:09:28 PM
Subject: Public Comment on Proposed Hahamongna Annex/Open Space Use

Mayor and City Council
City of Pasadena
117 East Colorado Blvd.
Pasadena, CA 91105

VIA E-Mail to Mayor and each Member

April 30, 2007

RE: Additional Comments on Proposed New Development of Open Space Annex Area of the Hahamongna Watershed Park - Proposed Hahamongna Annex/Open Space Tenants

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The City has a real opportunity to be a conservation leader. Not only of habitat and water, but for energy conservation. Let's make the Annex area an example within the State. Let's use solar panels as energy for the classrooms and offices. Let's get a biofuel or electric vehicle that is used for carpooling of PCC students. Let's take the use of the Annex area one step further than what is currently being proposed. The proposed roads and parking lots are an outdated way of thinking and planning. The Sage Council is known for our cutting-edge conservation tactics that push the envelope. We can make the Annex/Open Space an example of how local government and nonprofit conservation groups can work together for the Earth. I'm sure we could get the Governor, our grant makers and some celebrities to support this sort of use. We are willing if you are.

Sincerely,

Leeona Klippstein, Executive Director
Spirit of the Sage Council
30 North Raymond Ave., Suite 303
Pasadena, CA 91103
(626) 676-4116

leeona@earthlink.net

Rodriguez, Jane

Sent: Monday, April 30, 2007 12:38 PM
To: Rodriguez, Jane
Subject: FW: Sage Council comments on Proposed Hahamongna Annex/Open Space Project
Importance: High
Attachments: Pasadena settlement.pdf; THE ECOLOGICAL EFFECTS OF ROADS.doc; PasadenaPlanning Annex25th.pdf

Hello Jane,

Please provide a copy of this letter with attachments to the Mayor and each of the Council Members for tonight's meeting. I'm also forwarding to you two other email with additional comments and attachments. You should receive ~~three~~ two all together. Thank you.

Kind regards,
Leeona Klippstein, Executive Director
Spirit of the Sage Council

leeona@earthlink.net

----- Original Message -----
From:
To: bbogaard@ci.pasadena.ca.us;smadison@ci.pasadena.ca.us;jstreator@ci.pasadena.ca.us;plittle@ci.pasadena.c
Cc: shermanlaw@aol.com; Hugh Bowles
Sent: 4/29/2007 5:55:12 PM
Subject: Sage Council comments on Proposed Hahamongna Annex/Open Space Project

Mayor and City Council
City of Pasadena
117 East Colorado Blvd.
Pasadena, CA 91105

VIA E-Mail to Mayor and each Member

April 29, 2007

RE: Comment on Proposed New Development of Open Space Annex Area of the Hahamongna Watershed Park

Honorable Mayor Bogaard & City Council Members,

Spirit of the Sage Council (Sage Council) is a California corporation and nonprofit conservation organization, with our main office located in Old Town Pasadena. Our members and supporters reside in the City of Pasadena and throughout the United States.

In addition, Sage Council has provided expert testimony before the U.S. House of Representatives regarding the implementation of the Endangered Species Act. We have also participated on Habitat Conservation Planning Advisory Committees for the County of Riverside and San Bernardino, CA. Since 1991, our conservation work has resulted in the

4/30/2007
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permanent conservation of over 3,000-acres of threatened habitats in Southern California, including habitats in the Upper Arroyo Seco. Former Pasadena Mayor Holden recognized the outstanding conservation work, of the Arroyo Seco and Pasadena, of the Sage Council and presented us with a Proclamation at an Earth Day gathering. In 2000, the Sage Council created a sister nonprofit and land conservancy, The Habitat Trust for Wildlife, who owns and manages nearly 500-acres of rare habitats for endangered wildlife in western San Bernardino County.

As you are aware, the Sage Council has a long term standing concern and desire for the conservation of the Arroyo Seco ecosystem. We have previously commented on and legally challenged the City's approval of Master Environmental Impact (MEIR). Our legal challenge resulted in an out of court settlement (see attached contract).

Sage Council members and supporters have continued to monitor and watchdog the City's implementation of the ASMP MEIR, including the latest proposal. While the City has had informal community meetings and a Planning Commission Meeting last week, the City has only produced a map of the proposed Annex development area, not a Notice of Preparation (NOP), Initial Study (IS) and Environmental Impact Report (EIR) or Supplemental EIR (SEIR) that includes mitigation measures. These documents and certification are required under Public Law and California Environmental Quality Act (CEQA) Guidelines. This is not the first letter that the City has received regarding this concern.

The Sage Council is opposed to the currently proposed Project as indicated by a City map drawing. We request that the Mayor and City Council members direct staff to prepare a NOP, IS and SEIR to MEIR, including a range of Alternatives to the Project and adequate Mitigation of Negative Impacts to the Environment. An SEIR is required under CEQA when there is a Public Controversy and/or are Significant Changes to the Project and Environment. Presently there are both.

Historically, the City's proposed uses and development of the Arroyo Seco and the ASMP have been greatly controversial. This public controversy and opposition was so great that road expansions proposed in the draft MEIR were dropped from the final MEIR. However, these controversial roads have reappeared in the proposal before you. It appears, from the Annex Project Map that the City intends on building new roads, road expansions and parking lots that were not previously identified and mitigated for in the MEIR. It appears that these new development activities will impact heritage oaks, and other sensitive natural resources through construction activities and fragmentation of currently contiguous stands of oaks. Sage Council is opposed to such road and parking lot building. We have attached a scientific publication "The Ecological Effects of Roads," by the internationally renowned conservation biologist and author, Dr. Reed Noss, regarding the impact of roads on the environment, in support of our concerns. Please read it and have your staff read it.

"The Preferred Alternative"

"In evaluating various mitigation options for road-wildlife problems, it must be remembered that each is a compromise, addresses only a subset of the multiple ecological impacts of roads, and is far less satisfactory than outright road closure and obliteration. The serious conservationist recognizes that mitigation options should be applied only to roads already constructed, and which will be difficult to close in the near future (i.e., major

highways). In such cases, construction of viaducts over important wildlife movement corridors (as documented by road kills) and other critical natural areas should be vigorously pursued. Amphibian tunnels and other smaller underpasses also should be constructed where needed. But the bottom line is that no new roads should be built, and most existing roads -- especially on public lands -- should be closed and obliterated. This is the preferred alternative!" - Dr. Reed Noss.

Please remove any proposed new roads or road expansions, including new parking lots. Leave the area as is and as agreed upon in the City's acquisition contracts. This area has a conservation easement and any "Open Space" activites must conform with conservation. Our members, supporters and local residents have expressed to the City that they want conservation to be a priority. Nevertheless, the City continues to push for bicycle paths, equestrian camps and trails, roads and parking lots. The Sage Council continues to receive phone calls and emails from local community members that reside near Hahamongna and are displeased with the City's proposals. These people believe that their quality of life, neighborhoods and of local nature will be negatively impacted by the Hahamongna Annex proposal if implemented.

Another environmental issue that needs to be addressed, in a Project SEIR, is Traffic. It appears that the City intends to build roads and parking lots to encourage more people into the Arroyo Seco and Hahamonga Watershed Park. While we recognize the City's intent to utilize existing structures as places of education on natural resources and otherwise, the use of these structures as proposed is different. The way in which the existing buildings are proposed to be used is more intensive and will increase greater vehicle traffic and greater human impacts on designated conservation areas. More roads and more traffic translate into more air pollution and wildlife fatalities. The City should be taking actions to reduce car related pollution and curb Global Warming, instead of creating more.

In addition, the new roads, expansions and parking lots will pave over a watershed and known water recharge area. There is an existing Water Conservation Easement placed over the Arroyo Seco, thus the City should not take an actions that would result in loss of water recharge. **Therefore, we request that a SEIR be prepared that includes Natural Resources, Traffic, Air Quality and Water/Hydrology.**

As the saying goes, "The Devil is in the details." While some may view such a proposal for the Hahamongna Annex area as a good concept or idea, it is the responsibility of the City to be well informed and have a good look at all the pros and cons that the project may have on the environment. The public must be afforded this ability, also. While the City has had some public forums to discuss the potential uses of the land, there were no environmental studies or reports made available to the public, planning commission or city council to date. Without a SEIR to the MEIR, the City is acting without a safety net. Even if the City does not include the proposed Hahamongna Annex Project as part of the ASMP, but a new stand alone Project, CEQA Guidelines still require a new EIR. Regardless, the City cannot legally approve the proposed Hahamongna Annex Project without identifying and mitigating for negative impacts on the environment.

There are some enticing aspects of the proposed use of the buildings and we are pleased that the City has recognized a need to partner with non-profits. It does get expensive for non-profits to rent offices or file lawsuits to have local government agencies comply with environmental laws. There are no other non profit conservation groups, located in Pasadena that has devoted so much time and resources towards the conservation of natural and cultural lands of the Arroyo and Hahamongna. Sage Council would like to know if the City is willing to partner with us and provide some choice office space for our nonprofit in the old Forest Service office building. Our sister 501(c) 3 land trust, The Habitat Trust for Wildlife, is also interested. We would like to work cooperatively with the City to ensure that the Hahamongna Annex/Open Space area is used for conservation activities that do not cause any additional impacts on the precious ecology of the area.

Thank you for your time and consideration. If you have any questions or are in need of the Sage Council's assistance, please call (626) 676-4116.

Sincerely,

Leeona Klippstein, Executive Director
Spirit of the Sage Council
30 North Raymond Ave., Suite 303
Pasadena, CA 91103
www.SageCouncil.com www.myspace.com/sagecouncil

ATTACHMENTS - Settlement Agreement between City and Sage Council, April 25, 2007
Public Notice of Planning Commission Meeting, Scientific Report – Ecological Effects of Roads.

Copies: Law Office of Craig Sherman
Hugh Bowles, Hahamongna Watchdog Group

bbogaard@ci.pasadena.ca.us; smadison@ci.pasadena.ca.us; jstreator@ci.pasadena.ca.us; plittle@ci.pasadena.ca.us; cholden@ci.pasadena.ca.us; shaderlein@ci.pasadena.ca.us; vgordo@ci.pasadena.ca.us; styler@ci.pasadena.ca.us

SETTLEMENT AGREEMENT

This settlement agreement ("Agreement") is hereby given the effective date of February 9, 2004 and is being entered into between the City of Pasadena ("City") and Spirit of the Sage Council ("Sage Council").

On or about, May 14, 2003, the Spirit of the Sage filed a Petition for Writ of Mandate, LASC Case No. BS083201 ("Petition"). Through its Petition, Sage Council asked the Court to order the City to vacate and set aside the decision made by the City Council on April 14, 2003 to certify the Arroyo Seco Master Plan Project Master Environmental Impact Report ("MEIR") and any related approvals. Additionally, Sage Council seeks a Court order requiring the City to prepare a new or subsequent MEIR in the event the City decides to proceed with the Arroyo Seco Master Plan Project ("ASMP"). On or about, July 23, 2003 the City and the Sage Council filed a motion for a Temporary Stay in order to engage in settlement discussions. On or about, August 19, 2003, the City and the Sage Council met for a settlement conference with the Honorable Michael Berg.

City and the Sage Council desire to fully and finally settle, release and dispose of all the controversies and disputes raised in the Petition between them on the following terms and conditions, and in conjunction with said terms, conditions and reservation of rights, Sage Council agrees to dismiss the Petition with prejudice except as to such express terms, conditions and rights hereunder.

Upper Arroyo Seco / Hahamongna

1. City agrees to designate certain areas located in the Hahamongna area as "Natural Open Space," allowing only appropriate, passive recreation activities similar to and consistent with, but not limited to, the definition of natural preservation areas as defined by the current Pasadena Municipal Code Sections 3.32.100 and Section 3.32.120- nature preserves and natural

habitat areas. Signage indicating the nature preserve and limited use activity will be placed and posted in compliance with the Design Guidelines adopted for the Arroyo Seco. The map attached hereto as **Exhibit A** shows those areas City agrees to designate Natural Open Space. Areas for equestrian trails purposes, whether currently used or currently planned under the adopted ASMP, shall not be expanded in gross area of usage, and Sage Council is not giving up its rights to challenge equestrian usage authorized or approved by jurisdictions (other than City) to the extent that such activity is not otherwise in compliance with laws or regulations.

Sage Council acknowledges that pursuant to this Settlement Agreement the City is not agreeing to modify areas within the Hahamongna area that are controlled by other public entities such as those controlled or governed by the Los Angeles County, Angeles National Forest, Santa Monica Mountains Rim of the Valley Trail System and year-round equestrian passage through the Arroyo Seco, rather, this Settlement Agreement controls those areas that the City has authority and jurisdiction to regulate and control land use and land activities and specifically referenced in this Settlement Agreement.

2. City agrees not to expand the Frisbee Golf Course beyond the 18 holes. The boundary will be retained within that approximately sixty (60) acres of dedicated park land, as shown in the attached map titled **Exhibit B**, and incorporated into this Settlement Agreement pursuant to this reference. However, new play fields and nine holes of the Frisbee Golf Course will be located within the 60 acre site. Both development of the play fields and the relocation of the Frisbee Golf Course are to be located under terms, conditions, and any permit, agreement or approval as required by laws, regulations one or more of the following regulatory agencies: Los Angeles County Department of Public Works, California Department of Fish and Game ("CDFG") and United States Fish and Wildlife Service ("USFWS"), or United States Army Corps of Engineers ("USACOE") (collectively, the "Regulatory Agencies or "Resource Agencies"). The City also agrees to restore and rehabilitate the oak woodland where the back

nine holes currently exist and some of the front nine holes exist. Sage Council reserves the right to monitor, participate, object and/or challenge any necessary Regulatory Agency permit, application, process or approval. Any such challenge shall not name the City in any lawsuit relating thereto.

3. The City agrees that there will be no active recreation and no additional athletic fields on the eastside of the Hahamongna Watershed Park area. The City agrees to restore and rehabilitate the periphery of Johnson Field and agrees to develop or construct no additional play fields or ball fields in the Upper Arroyo Seco / Hahamongna Master Plan area except for the aforementioned fields in paragraph 2. The exact area is outlined in the map attached hereto as **Exhibit B,** and which is incorporated into the Settlement Agreement by this reference. The restoration will take place as outlined in Section 4 of the Hahamongna Watershed Park Master Plan.

4. For the Upper Arroyo Seco / Hahamongna Master Plan area, the City also agrees to mitigate for the loss of oak woodland, sage scrub, southern willow scrub, streambed riparian, as shown on Figure 4.6.2-1 of the Final MEIR at not less than a one-to-one ratio, and such that there is no net loss in extent or value of each of the above stated plant habitats. The location and type of mitigation that will be performed is subject to approval by the Regulatory Agency having jurisdiction over the mitigation.

5. The City agrees to use its best efforts to assist JPL in finding an alternative parking solution so that the natural resources goals for this area and the Arroyo Seco at large, can be realized. City agrees to include this provision in the MEIR's Monitoring Plan.

6. The City also agrees that for all land area (above ground), including watershed areas and slopes, within the adopted ASMP area requiring restoration, rehabilitation, revegetation or reconstruction, whether arising from a project mitigation requirement, the terms of this Agreement, or other Council approved activities under the adopted ASMP, shall be

carried forth in consultation with USFWS or CDFG, and any other appropriate regulatory agency having jurisdiction, and shall be monitored according to the standards specified by such appropriate regulatory agencies. The progress and implementation of which shall be reported in writing on an annual basis during implementation over a five year period and any inadequacies found at the time of reporting shall require City to use its best efforts and diligence to take actions to achieve successful restoration as reasonably requested by said regulatory agencies.

City agrees to provide the Sage Council with copies of any reports, in a timely manner, that are prepared regarding the restoration and to allow the Sage Council to have meaningful review and comment for City and regulatory agency consideration.

7. City agrees that prior to the City funding, implementing, or constructing any existing or future project under the adopted ASMP, City shall consult with USFWS and CDFG on the environmental clearance for any permits required from a Federal Agency, including but not limited to the U.S. Army Corps of Engineers.

8. City agrees not to construct any new cultural or visitor centers under the ASMP as currently adopted. However, Sage Council acknowledges that there will be one (1) new lookout point project entitled "Dam Observation Trail". The lookout point is located between the Flint Wash Bridge Crossing Project and Devil's Gate Dam. All impacts related to the project and its construction shall be addressed prior to any construction via a regulatory permit, if required, and mitigation plan/program shall be consistent with an environmental study or required permit or regulatory agreement. City agrees that the lookout point project entitled "Dam Observation Trail shall (a) be restricted to pedestrian use only, (b) shall be closed from sunset to sunrise, and (c) shall make reasonable efforts to restrict off trail activities from the lookout point and primary trail.

9. City agrees not to remove any existing trees in the Upper Arroyo and Hahamongna areas as defined in the ASMP, unless it is in compliance with the City's Tree

Ordinance, as may be amended. Dead or dying trees shall be left in situ for ecological purposes. However, Sage Council acknowledges that the City may remove dead or dying limbs and trees that pose threats to persons or structures as determined in the City's sole discretion.

10. City agrees that any and all substantial disturbances within jurisdictional areas of the Resource Agencies (USACOE, USFWS, CDFG), or other agencies shall proceed only in consultation with the agency or agencies having legal jurisdiction over the area or the proposed activity. City also agrees to have all disturbed areas monitored and restored by a qualified conservation biologist in consultation with the appropriate agencies consistent with the requirements of Paragraph 6 above.

Rose Bowl

1. City shall pay Spirit of the Sage Council Fifty Thousand Dollars ($50,000) within thirty days (30) of fully executed agreement between the National Football League ("NFL") and City to locate a team or franchise at the City of Pasadena, Rose Bowl. The check shall be made payable to Social & Environmental Entrepreneurs (on behalf of Spirit of the Sage Council, as its fiscal sponsor), a duly incorporated non profit organization pursuant to the Internal Revenue Code Section 501(c)(3). Spirit of the Sage Council acknowledges that the $50,000 received pursuant to this Settlement Agreement cannot be used for employee salary or legal fees for either Spirit of the Sage or Social & Environmental Entrepreneurs.

2. Spirit of the Sage agrees not to object, challenge or bring any legal action related in anyway whatsoever to any approval for any improvement, project or other entitlement related to locating an NFL team to Rose Bowl in the City. Such restriction to object, challenge or bring any legal actions against including, but not limited to, the City, the Rose Bowl Operating Company, the City's, employees, consultants, agents, the NFL, its agents, employees, or

consultants, shall include, but not be limited to the environmental analysis embodied in the proposed NFL Environmental Impact Report.

Lower Arroyo

1. City agrees not to construct any new bike paths or roads. However, Sage Council acknowledges that City will restore the Flint Wash Bridge Crossing located in Hahamongna Watershed Park. All impacts caused by the restoration shall be addressed prior to any restoration activity via a regulatory permit or agreement, if required, and mitigation plan/program consistent with an environmental review.

2. City agrees to require that all dogs be kept on leash and to indicate that requirement by posting signs. However, Sage Council acknowledges that City will post signs only in compliance with the Design Guidelines adopted for the Arroyo Seco.

3. City agrees not to construct any new cultural or visitors centers under the adopted ASMP.

4. City agrees not to remove any existing trees in the Lower Arroyo as identified in the ASMP, unless it is in compliance with the City's Tree Ordinance. Dead or dying trees shall be left in situ for ecological purposes. However, Sage Council acknowledges that the City may remove dead or dying limbs and trees that pose threats to persons or structures as determined in the City's sole discretion.

5. City agrees that all land area restoration, rehabilitation, revegetation or reconstruction shall be conducted in consultation with a qualified biologist, and subject to the terms of Paragraph 5 above for the Upper Arroyo Seco/Hahamongna.

6. Consistent with Paragraph 6 (Upper Hahamongna) City shall consult with Resources Agencies having jurisdiction over the particular site or relevant activity.

Other

1. City agrees to pay Craig A. Sherman and Sage Council their reasonable litigation expenses and reasonable attorneys' fees in the total amount of Twenty Thousand Dollars $20,000 within thirty days (30) from the date of filing the dismissal.

2. It is understood and agreed that this settlement is the compromise of alleged and disputed claims, and any payment made or conditions agreed are not to be construed as an admission of liability on the part of the City nor shall it be construed as giving the Sage Council nor any third party any rights separate and distinct from rights offered to the public generally over public lands within the City of Pasadena and located in the Arroyo Seco.

3. The settlement terms embodied in this Settlement Agreement are not intended to bind the City in perpetuity. The terms of this Settlement relate only to the projects identified in the ASMP and receiving the environmental clearance pursuant the certified MEIR. Spirit of the Sage Council acknowledges, that the City Council, may propose projects within the Upper, Lower, Central and Hahamongna area of the Arroyo, so long as the City complies with all the necessary State and local environmental clearance requirements. Sage Council reserves the right to monitor, participate, object any and all necessary Resource Agency permits, applications, processes or approvals and consultations involving the City and the subject geographical areas encompassed within this Agreement, although Sage Council agrees that it shall not file any lawsuit or litigation regarding the results of such permits, applications, approvals or consultations,

4. It is further understood and agreed that this Agreement intends to resolve any and all claims regarding Sage Council's alleged deficiencies of the MEIR, however this Settlement Agreement expressly does not resolve, and Sage Council's rights are expressly reserved to object, comment, and if necessary litigate future projects not included in the ASMP and that have

not received the necessary environmental clearance under the MEIR certified by the City Council.

5. The parties warrant and represent that in executing this Agreement, they have relied on legal advice from their attorney of the undersigned, that the terms of this Agreement and its consequences have been completely read and explained to the undersigned by that attorney, and that the undersigned fully understand the terms of this release. The undersign warrant that they have the designation and authority to enter into this Settlement Agreement.

6. Sage Council and City further declare and represent that no promise, inducement or agreement not herein expressed has been made to the undersigned, that this Agreement contains the entire agreement between the parties hereto, and that the terms of this Agreement are contractual and not a mere recital.

SPIRIT OF THE SAGE COUNCIL

Dated: 3/8/04

By: _____
Leeona Klippstein
Authorized Representative
Spirit of the Sage Council

CITY OF PASADENA

Dated: 3/15/04

By: _____
Michele Beal Bagneris, City Attorney
CITY OF PASADENA, a municipal corporation

[Signatures continued on Next Page]

APPROVED AS TO FORM:

Dated: 2/9/04

Craig A. Sherman
Attorney for Spirit of the Sage Council

Dated: 3/9/04

Frank Rhemrev
Maribel S. Medina
Assistant City Attorneys for the
City of Pasadena

THE ECOLOGICAL EFFECTS OF ROADS

-or-

THE ROAD TO DESTRUCTION

by Reed Noss, PhD

Nothing is worse for sensitive wildlife than a road. Over the last few decades, studies in a variety of terrestrial and aquatic ecosystems have demonstrated that many of the most pervasive threats to biological diversity - habitat destruction and fragmentation, edge effects, exotic species invasions, pollution, and overhunting - are aggravated by roads. Roads have been implicated as mortality sinks for animals ranging from snakes to wolves; as displacement factors affecting animal distribution and movement patterns; as population fragmenting factors; as sources of sediments that clog streams and destroy fisheries; as sources of deleterious edge effects; and as access corridors that encourage development, logging and poaching of rare plants and animals. Road-building in National Forests and other public lands threatens the existence of de facto wilderness and the species that depend on wilderness.

Despite heightened recognition (by informed people) of the harmful effects of roads, road density continues to increase in the US and other countries. Federal, state, and local transportation departments devote huge budgets to construction and upgrading of roads. Multinational lending institutions, such as the World Bank, finance roads into pristine rainforest, which usher in a flood of settlers who destroy both the rainforest and the indigenous cultures. Public land-managing agencies build thousands of miles of roads each year to support their resource extraction activities, at a net cost to the taxpayer. The US Forest Service alone plans to build or reconstruct almost 600,000 miles of roads in the next 50 years. Most public agencies disregard the ecological impacts of roads and attempt to justify timber roads as benefiting recreation and wildlife management. Even when a land manager recognizes the desirability of closing roads, he or she usually contends that such closures would be unacceptable to the public.

This article will review some ecological effects of roads, with emphasis on impacts to wildlife (broadly defined). My concern is with all roads, from primitive logging roads to four-lane highways. Although the effects of different types of roads vary, virtually all are bad, and the net effect of all roads is nothing short of catastrophic. The technical literature that pertains to this topic is vast, and an entire book would be needed to summarize it adequately. Consider this only an introduction, or an "executive summary" of a massive tragedy.

Direct effects, such as flattened fauna, are easy to see. In contrast, many indirect effects of roads are

cumulative and involve changes in community structure and ecological processes that are not well understood. Yet, these long-term effects signal a deterioration in ecosystems that far surpasses in importance the visual and olfactory insult to us of a bloated deer by the roadside.

Direct Effects

Roadkills

The above statement notwithstanding, roadkill can have a significant impact on wildlife populations. The Humane Society of the US and the Urban Wildlife Research Center have arrived at a conservative figure of one million animals killed each day on highways in the United States. When I-75 was completed through a major deer wintering area in northern Michigan, deer road mortality increased by 500%. In Pennsylvania, 26,180 deer and 90 bears were killed by vehicles in 1985. These statistics do not account for animals that crawl off the road to die after being hit. Also, roadkill statistics are invariably biased toward mammals, against reptiles, amphibians, and probably birds, and do not include invertebrates at all (who wants to count the insects smashed on windshields and grills?).

Vehicles on high-speed highways pose the greatest threat to wildlife. Unpaved roads, particularly when "unimproved," are less dangerous. Roadkill usually increases with volume of traffic. In one Texas study, however, mortality was greatest on roads with intermediate volumes, presumably because higher-volume roads had wider rights-of-way that allowed better visibility for animals and drivers alike. Increases in traffic volume do result in more collisions on any given road, and in our profligate society more people means more cars on virtually every road.

Florida is a rapidly-developing state with more than 1000 new human residents each day and over 50 million tourists annually. Primary and interstate highway mileage has increased by 4.6 miles per day for the last 50 years. Hence it is no surprise that roadkills are the leading known cause of death for all large mammals except white-tailed deer. Roadkills of Florida black bear, a subspecies listed as threatened by the state, have been rising sharply in recent years, from 2-3 per year in the 1970s to 44 in 1989. Many of the bears are killed on roads through public lands, in particular the Ocala National Forest. Seventeen Florida panthers, one of the most endangered subspecies of mammals in the world, are known to have been killed on roads since 1972. Since 1981, 65% of documented Florida panther deaths have been roadkills, and the population of only about 20 individuals is unlikely to be able to sustain this pressure. An average of 41 Key Deer, a species listed as Endangered by the U.S. Fish and Wildlife Service, were killed on roads yearly from 1980 through 1986, and 57 were killed in 1987. Roadkill is also the leading cause of mortality for the American crocodile, also an endangered species, in south Florida. The Florida scrub jay, a threatened species, has been found to suffer considerable mortality from collision with vehicles, and researchers have

concluded that these birds cannot maintain stable populations along roads with considerable high-speed traffic.

Snakes are particularly vulnerable to roadkill, as the warm asphalt attracts them; yet their carcasses are seldom tallied. Herpetologists have noted dramatic declines of snakes in Paynes Prairie State Preserve near Gainesville, Florida, which is crossed by two four-lane highways. This preserve was once legendary for its diversity and density of snakes, but no more. Similarly, a study of south Florida herpetofauna by Wilson and Porras attributed declines in many snakes to the increasing road traffic in that region.

Roadkill is a classic death-trap phenomenon. Animals are attracted to roads for a variety of reasons, often to their demise. Snakes and other ectotherms go there to bask, some birds use roadside gravel to aid their digestion of seeds, mammals go to eat de-icing salts, deer and other browsing herbivores are attracted to the dense vegetation of roadside edge, rodents proliferate in the artificial grasslands of road verges, and many large mammals find roads to be efficient travelways. Songbirds come to dust bathe on dirt roads, where they are vulnerable to vehicles as well as predators. Vultures, crows, coyotes, raccoons, and other scavengers seek out roadkills, often to become roadkills themselves.

Road Aversion and Other Behavioral Modifications

Not all animals are attracted to roads. Some have learned that roads bring unpleasant things, such as people with guns. Species that show road aversion exhibit decreasing densities toward roads. Various studies report that turkey, white-tailed deer, mule deer, elk, mountain lions, grizzly bears, and black bears avoid roads. When these animals are disturbed by vehicles, they waste valuable energy in flight. Other studies show conflicting results, which usually can be explained by differences in road use. Certain bird species also have been found to avoid roads, or the forest edges associated with roads. in the Netherlands, researchers found some bird species to be displaced up to 2000 meters from busy highways.

The American elk is one of the best-studies species with respect to road aversion. Elk avoidance of roads is clearly a learned response (they do not avoid natural edges), and is related to traffic volume and hunting pressure. In western Montana, Jack Lyon found that elk avoid areas within 1/4-1/2 mile of roads, depending on traffic, road quality, and the density of cover near the road. According to work by Jack Thomas in Oregon, a road density of one mile per square mile of land results in a 25% reduction in habitat use by elk; two miles of road per square mile can cut elk habitat use by half. As road density increases to six miles of road per square mile, elk and mule deer habitat use falls to zero. Elk in some areas have learned that roads are dangerous only in the hunting season, and do not show road aversion in other seasons. Other studies suggest that elk avoid open roads, but not closed roads. Where hunting pressure is

high, however, even closed roads may be avoided because so many hunters walk them.

Grizzly bears also may be displaced by roads. In British Columbia, grizzlies were found to avoid areas within 1/2 mile of roads. A study in the Cabinet Mountains of northwestern Montana determined that the mean distance of grizzly radio-telemetry signals from open roads (2467 m) was significantly greater than the mean distance from closed roads (740 m). Other studies have found that grizzlies avoid areas near roads, especially by day, even when preferred habitat and forage are located there. This is particularly alarming, because in Yellowstone National Park, which has the second largest grizzly population in the lower 48, roads and developments are situated in the most productive grizzly bear habitat. Natural movements of grizzly bears may also be deflected by roads, as Chuck Jonkel has documented in Montana. In other cases, however, grizzlies may use roads as travelways, particularly when they find off-road travel difficult due to dense brush or logging slash. Grizzlies have also learned to exploit the hastened growth of forage plants near roads in spring. Similarly, the abundance of soft mast such as pokeberry and blackberry along road edges attracts Appalachian black bears in summer. Any advantages associated with roads for either bear species are outweighed by the increase in sometimes fatal (usually for the bear, unfortunately) encounters with humans.

Wild animals can become habituated to roads. Thirty years ago, for example, bears in Yellowstone, the Great Smokies, and other parks often sat along the roadsides and picnic areas waiting for handouts from tourists. When parks disallowed handouts and relocated habituated bears, the attraction subsided. In any area where animals are exposed to frequent human activity, habituation can be expected. This is not necessarily a desirable response, however. Although animals that are acclimated to roads and vehicles do not waste energy reserves in flight response, some of them become aggressive toward people. Aggressive behavior of habituated animals has been noted in bears, mule deer, elk, bighorn sheep, bison, and other species. Conflicts occur most often when humans approach animals closely in order to feed or photograph them. A few years ago in the Smoky Mountains, a bear reportedly chomped on a baby's face when a parent held it close for a kissing photo -- the baby's cheek had been smeared with honey. Such encounters usually result in relocation or killing of the "problem" animals, though the real problem is human stupidity. Studies of grizzly bears in Montana and British Columbia have found that bears habituated to human activity, especially moving vehicles, are more vulnerable to legal and illegal shooting.

Fragmentation and Isolation of Populations

Some species of animals simply refuse to cross barriers as wide as a road. For these species, a road effectively cuts the population in half. A network of roads fragments the population further. The remaining, small populations are then vulnerable to all the problems associated with rarity: genetic deterioration from

inbreeding and random drift in gene frequencies, environmental catastrophes, fluctuations in habitat conditions, and demographic stochasticity (i.e., chance variation in age and sex ratios). Thus, roads contribute to what many conservation biologists consider the major threat to biological diversity: habitat fragmentation. Such fragmentation may be especially ominous in the face of rapid climate change. If organisms are prevented from migrating to track shifting climatic conditions, and cannot adapt quickly enough because of limited genetic variation, then extinction is inevitable.

In one of the first studies on habitat isolation by roads, D.J. Oxley and co-workers in southeastern Ontario and Quebec found that small forest mammals such as the eastern chipmunk, gray squirrel, and white-footed mouse rarely ventured onto road surfaces when the distance between forest margins(road clearance) exceeded 20 meters. The authors suggested that divided highways with a clearance of 90 meters or more may be as effective barriers to the dispersal of small mammals as water bodies twice as wide. Earlier work in Africa had shown that tortoises, and young ostrich, warthogs, and African elephants, had difficulty crossing roads with steep embankments. In Germany, Mader found that several species of woodland carabid beetles and two species of forest-dwelling mice rarely or never crossed two-lane roads. Even a small, unpaved forest road closed to public traffic constituted a barrier. All of these animals were physically capable of crossing roads, but appeared to be psychologically constrained from venturing into such openings. In Ontario, Merriam and co-workers found that narrow gravel roads were "quantitative barriers" to white-footed mice in forest fragments; many fewer mice crossed roads than moved an equal distance in the forest alongside roads.

In forests, a road clearance constitutes an obviously contrasting habitat. One might expect that the barrier effect of roads would be less severe in more open habitats, where the contrast between the road and adjoining habitat is less. Yet, a study by Garland and Bradley of the effects of a four-lane highway on rodents in the Mojave Desert found that rodents almost never crossed the road. Of eight species captured, marked, and recaptured, only an adult male antelope ground squirrel crossed the entire highway. No roadkills were observed, suggesting that few rodents ever ventured onto the highway.

Animals far more mobile than rodents and beetles may hesitate to cross roads. In the southern Appalachians, Brody and Pelton found that radio-collared black bears almost never crossed an interstate highway. In general, the frequency at which bears crossed roads varied inversely with traffic volume. Bears appeared to react to increasing road densities by shifting their home ranges to areas of lower road density. The power of flight may not override the barrier effect of roads for some bird species. Many tropical forest birds are known to be averse to crossing water gaps no wider than a highway. Further research is needed to determine if these species react to road clearings as they do to water gaps.

Thus, populations of many animal species divided by a heavily traveled road may be just as isolated from one another as if they were separated by many miles of barren urban or agricultural land. Larry Harris and Peter Gallagher, writing in a recent Defenders of Wildlife publication on habitat corridors ("Preserving Communities & Corridors" available from Defenders, 1244 19th St. NW, Washington, DC 20036; $10 each), put the road fragmentation problem into proper perspective: "Consider this triple jeopardy: At the same time that development reduces the total amount of habitat, squeezing remaining wildlife into smaller and more isolated patches, the high-speed traffic of larger and wider highways eliminates more and more of the remaining populations." To the extend that various plant species depend on road-averse animals for dispersal, roads fragment plant populations as well.

Pollution

Pollution from roads begins with construction. An immediate impact is noise from construction equipment, and noise remains a problem along highways with heavy traffic. Animals respond to noise pollution by altering activity patterns, and with an increase in heart rate and production of stress hormones. Sometimes animals become habituated to increased noise levels, and apparently resume normal activity. But birds and other wildlife that communicate by auditory signals may be at a disadvantage near roads. Highway noise can also disrupt territory establishment and defense. A study by Andrew Barrass found that toads and treefrogs showed abnormal reproductive behavior in response to highway noise.

Vehicles emit a variety of pollutants, including heavy metals, carbon dioxide, and carbon monoxide, all of which may have serious cumulative effects. Combustion of gasoline containing tetraethyl lead, and wear of tires containing lead oxide, result in lead contamination of roadsides. Although unleaded gasoline now accounts for more than half of all gasoline used in the US, lead persists in soils and the food web for long periods. In Kansas, lead levels in roadside soils and vegetation in the early 1980s were two to three times greater than from near roads with similar traffic volumes in 1973 and 1974, when the use of unleaded gasoline was 42% lower.

Many studies have documented increasing levels of lead in plants with proximity to roads, and with increases in traffic volume. Plant roots take up lead from the soil, and leaves take it from contaminated air or from particulate matter on the leaf surface. This lead moves up the food chain, with sometimes severe toxic effects on animals, including reproductive impairment, renal abnormalities, and increased mortality rates. Food chain effects can switch between aquatic and terrestrial pathways. Lead concentrations in tadpoles living near highways can be high enough to cause physiological and reproductive impairment in birds and mammals that prey on tadpoles.

Less is known about the effects of other heavy metals, such as zinc, cadmium, and nickel. Motor oil and

tires contain zinc and cadmium: motor oil and gasoline contain nickel. These metals, like lead, have been found to increase with proximity to roads, and with increasing traffic volume and decreasing soil depth. Earthworms have been found to accumulate all these metals, in concentrations high enough to kill earthworm-eating animals. These roadside contaminants can be carried far from roads by wind and water. Lead contamination has been noted up to 100 miles from the nearest metropolitan area.

The maintenance of roads and roadsides also introduces a variety of pollutants into roadside ecosystems. Americans like their roads free of ice and dust, and their roadsides free of weeds. The effects of herbicides on wildlife and ecosystems have been poorly studied, but anyone who has witnessed the destruction of wildflowers and other plants along roadsides (even through parks) for the sake of tidiness has cause to complain.

Highway de-icing programs are notorious sources of saline pollution. In the early 1970s, it was estimated that 9-10 million tons of sodium chloride, 11 million tons of abrasives, and 30,000 tons of calcium chloride were used in the US each year for highway de-icing. As noted above, many animals are attracted to this salt and end up as roadkills or at least get a dose of the salt's toxic additives, including cyanide compounds. Drainage of salt-laden water from roads into aquatic ecosystems may stimulate growth of blue-green algae; the chloride concentration of major water bodies near urban areas has been found to increase by as much as 500%. Furthermore, sodium and calcium ion exchange with mercury releases toxic mercury into these systems. The cyanide ions from rust-inhibiting additives are extremely toxic to fish.

In many rural areas, waste oil from crankcases is sprayed onto unpaved roads for dust control. A 1974 study estimated that some 100 million gallons of waste oil are sprayed on dirt roads in the US each year. Only about 19% of this oil remains in the top inch of a road surface. Much of it reaches water bodies, where it coats the surface, limiting oxygen exchange and sunlight penetration and having toxic effects on aquatic organisms.

Impacts on Terrestrial Habitats

The impacts of roads on terrestrial ecosystems include direct habitat loss; facilitated invasion of weeds, pests, and pathogens, many of which are exotic (alien); and a variety of edge effects. Roads themselves essentially preempt wildlife habitat. A 1976 report by the Council on Environmental Quality estimated that one mile of interstate highway consumes up to 48 acres of habitat. Logging roads result in the clearing of about 50 acres for each square mile of commercial forest (i.e., 10 acres are deforested for every mile of road, and each square mile of forest averages 5 miles of road). Road construction also kills animals and plants directly, and may limit long-term site productivity of roadsides by exposing low nutrient subsoils, reducing soil water holding capacity, and compacting surface materials. It also makes slopes more

vulnerable to landslides and erosion, which in turn remove additional terrestrial wildlife habitat and degrade aquatic habitats.

Some species thrive on roadsides, but most of these are weedy species. In the Great Basin, rabbitbrush is usually more abundant and vigorous along hard-surfaced roads than anywhere else, because it takes advantage of the runoff water channeled to the shoulders. Although certainly attractive, the common rabbitbrush species are in no danger of decline, as they invade disturbed areas such as abandoned farmsteads and fence rows, and are considered an indicator of overgrazing. In the Mojave Desert, creosote bush is another abundant species that opportunistically exploits the increased moisture levels along roadsides.

Many of the weedy plants that dominate and disperse along roadsides are exotics. In some cases, these species spread from roadsides into adjacent native communities. In much of the west, spotted knapweed has become a serious agricultural pest. This Eurasian weed invades native communities from roadsides, as does the noxious tansy ragwort. In Florida, a state plagued by exotic plants, one of the biggest offenders is Brazilian pepper. This tall, fast-growing shrub readily colonizes roadside habitats. When soil in adjacent native habitats is disturbed by off-road vehicles, Brazilian pepper invades. Invasion by Brazilian pepper and other roadside exotics is becoming a serious problem in the Atlantic coastal scrubs of south Florida, communities endemic to Florida and containing many rare species. Another invasive exotic, Melaleuca, is expanding from roadsides and dominating south Florida wetlands. In southwest Oregon and northwest California, an apparently introduced root-rot fungus is spreading from logging roads and eliminating populations of the endemic Port Orford cedar.

Opportunistic animal species also may benefit from roads. Grassland rodents, for example, sometimes extend their ranges by dispersing along highway verges. In 1941, L.M. Huey documented a range extension of pocket gophers along a new road in the arid Southwest. Meadow voles have been found to colonize new areas by dispersing along the grassy rights-of-way (ROWs) of interstate highways. Roads also facilitate dispersal of prairie dogs. In 1983, Adams and Geis reported that more species of rodents may be found in highway ROWs than in adjacent habitats, though several species avoid ROW habitat. Birds associated with grassland or edge habitat, such as the European starling, brewer's and red-winged blackbirds, brown-headed cowbird, indigo bunting, white-throated sparrow, song sparrow, and killdeer, all have been found to increase in abundance near roads. Cliff and barn swallows, starlings, house sparrows, and rock doves (the latter three are exotic species in North America) often nest and roost in highway bridges. Many species of birds and mammals feed on roadkill carrion.

Some people claim that increases in grassland, edge, and other opportunistic species near roads constitute

a benefit of roads. But increased density near roads may not be favorable for the animals involved, if the road exposes them to higher mortality from heavy metal poisoning or collision with vehicles. In this sense, a road can be an "ecological trap" and a "mortality sink" for animal populations. Furthermore, the species that may benefit from roads are primarily those that tolerate or even thrive on human disturbance of natural landscapes, and therefore do not need attention from conservationists (except occasional control). Many of these weedy species are exotic, and have detrimental effects on native species.

Edge effects, once considered favorable for wildlife because many game species (e.g., white-tailed deer, eastern cottontail, northern bobwhite) are edge-adapted, are now seen as one of the most harmful consequences of habitat fragmentation. Especially when it cuts through an intact forest, a road introduces a long swath of edge habitat. Forest edge is not a line, but rather a zone of influence that varies in width depending on what is measured. Changes in microclimate, increased blowdowns, and other impacts on vegetation may extend 2-3 tree-heights into a closed-canopy forest. Shade-intolerant plants, many of them exotic weeds, colonize the edge and gradually invade openings in the forest interior. Dan Janzen found weedy plant species invading treefall gaps in a Costa Rican forest up to 5 kilometers from the forest edge. Changes in vegetation structure and composition from edge effects can be more persistent than effects of clearcutting, from which at least some forest types will eventually recover, if left alone.

The brown-headed cowbird, originally abundant in the Great Plains but now throughout most of North America because of forest fragmentation, is known to penetrate forests at least 200 meters from edge. The cowbird is a brood parasite that lays its eggs in the nests of other bird species and can significantly reduce the reproductive success of its hosts. Forest birds, most of which did not evolve with the cowbird and are now well adapted to its parasitism, may show serious declines in areas where cowbirds have become common. In addition, many opportunistic nest predators, such as jays, crows, raccoons, and opossums, are common in roadside environments (partially because of supplemental food in the form of carrion) and often concentrate their predatory activities near edges. Increases in nest predation from these opportunities can extend up to 600 meters from an edge, as shown by David Wilcove using artificial nest experiments.

A narrow logging road with no maintained verge would not be expected to generate substantial edge effects, particularly if surrounded by a tall forest canopy. In this sense, the road would not differ much from a hiking trail (even trails create some edge effects, however, such as invasion of weedy plants caused by pant-legs dispersal). As forest roads are "improved," road clearance increases and allows more penetration of sunlight and wind. Edge species are then attracted to these openings. Two-lane roads with maintained rights-of-way and all interstate highways are lined by edge habitat. A forest criss-crossed by improved roads may be largely edge habitat, and its value for conservation of native flora and fauna

diminished accordingly.

Impacts on Hydrology and Aquatic Habitats

Road construction alters the hydrology of watersheds through changes in water quantity and quality, stream channel morphology, and ground water levels. Paved roads increase the amount of impervious surface in a watershed, resulting in substantial increases in peak runoff and storm discharges. That usually means flooding downstream. Reduced evapotranspiration within road rights-of-way may also result in increased runoff and streamflows. However, increases in streamflows in forested watersheds are not usually significant unless 15% or more of the forest cover is removed by road construction and associated activities such as logging.

When a road bed is raised above the surrounding land surface, as is normally the case, it will act as a dam and alter surface sheet flow patterns, restricting the amount of water reaching downstream areas. Mike Duever and co-workers found this to be a significant problem in the Big Cypress-Everglades ecosystem of south Florida. Ditches dug for road drainage often drain adjacent wetlands as well. The US Fish and Wildlife Service, in 1962, estimated that 99,292 acres of wetlands in western Minnesota had been drained as a result of highway construction. This drainage occurred at a rate of 2.33, 2.62, and 4.10 acres of wetland per mile of road for state and federal, county, and township highways, respectively.

Roads concentrate surface water flows, which in turn increases erosion. Megahan and Kidd, in 1972, found that erosion from logging roads in Idaho was 220 times greater than erosion from undisturbed sites. Logging roads used by more than 16 trucks per day may produce 130 times more sediment than do roads used only by passenger cars. Incision of a slope by roadcuts in mountainous areas may intercept subsurface flow zones, converting subsurface flow to surface flow and increasing streamflow rates. Water tables are almost always lowered in the vicinity of a road.

Where a road crosses a stream, engineers usually divert, channelize, or otherwise alter the stream channel. Culverts and bridges alter flow patterns and can restrict passage of fish. Channelization removes natural diverse substrate materials, increases sediment loads, creates a shifting bed load inimical to bottom-dwelling organisms, simplifies current patterns, lowers the stream channel and drains adjacent wetlands, reduces the stability of banks, and exacerbates downstream flooding.

The impacts of roads on fish and fisheries have long concerned biologists. Increased erosion of terrestrial surfaces almost inevitably results in increased sedimentation of streams and other water bodies. Even the best designed roads produce sediment, and unpaved roads continue to produce sediment for as long as they remain unvegetated. A divided highway requiring exposure of 10 to 35 acres per mile during

construction produces as much as 3000 tons of sediment per mile. In a study of the Scott Run Basin in Virginia, Guy and Ferguson found that highway construction contributed 85% of the sediment within the basin. The yield was 10 times that normally expected from cultivated land, 200 times that from grasslands, and 2000 times that from forest land. Studies in northwestern California show that 40% of total sediment is derived from roads and 60% from logged areas. Much of the sedimentation associated with roads occurs during mass movements (i.e., landslides) rather than chronic surface erosion. Roads dramatically increase the frequency of landslides and debris flows. Studies in Oregon have found that roads trigger up to 130 times more debris torrents than intact forest.

Increased sediment loads in streams have been implicated in fish declines in many areas. A 1959 study on a Montana stream, reported by Leedy in 1975, found a 94% reduction in numbers and weight in large game fish due to sedimentation from roads. Salmonids are especially vulnerable to sedimentation because they lay their eggs in gravel and small rubble with water flow sufficient to maintain oxygen supply. Fine sediments may cement spawning gravels, impeding the construction of redds. Increases in fine sediments also reduce the availability of oxygen to eggs and increase embryo mortality. Stowell and co-workers reported that deposition of 25% fine sediments in spawning rubble or gravel reduces fry emergence by 50%. Sedimentation also has negative effects on the invertebrate food supply of many fish. Furthermore, destruction of riparian vegetation by road construction results in higher water temperatures, which reduces dissolved oxygen concentrations and increases fish oxygen demands (a "double whammy"). If the fishing public was adequately informed of the negative effects of roads on fisheries, perhaps all but the laziest would demand that most roads on public lands be closed and revegetated!

Indirect Effects

Access

The most insidious of all effects of roads is the access they provide to humans and their tools of destruction. Let's face it, the vast majority of humans do not know how to behave in natural environments. Fearful of experiencing nature on its own terms, they bring along their chainsaws, ATVs, guns, dogs and ghetto-blasters. They harass virtually every creature they meet, and leave their mark on every place they visit. The more inaccessible we can keep our remaining wild areas to these cretins, the safer and healthier these areas will be. Those humans who respect the land are willing to walk long distances. If this is an "elitist" attitude, so be it; the health of the land demands restrictions on human access and behavior.

Many animal species decline with increasing road density precisely because roads bring humans with guns. For many large mammals, road aversion is not related to any intrinsic qualities of the road, but rather to their learned association of roads with danger. In other cases, mammals may continue to use roads

because they provide convenient travelways or food supply, but are unable to maintain populations where road densities are high because of the mortality they suffer from legal or illegal hunting, or roadkill.

An historical study by Richard Thiel in northern Wisconsin, supplemented by modern radio-telemetry, showed that road density was the best predictor of gray wolf habitat suitability. As road density increased in the study area, the wolf population declined. Wolves failed to survive when road densities exceeded .93 mile per square mile (.58 km per square km). Similar studies in Michigan and Ontario by Jensen and co-workers, and in Minnesota by Mech and co-workers, found a virtually identical threshold level for the occurrence of wolves. Roads themselves do not deter wolves. In fact, wolves often use roads for easy travel or to prey on the edge-adapted white-tailed deer. But roads provide access to people who shoot, trap, or otherwise harass wolves. David Mech found that over half of all known wolf mortality was caused by humans, despite the "protection" of the Endangered Species Act.

Many other large mammal species have been found to decline with increasing road access. The Florida panther once ranged throughout the Southeast, from South Carolina through southern Tennessee into Arkansas, Louisiana and extreme eastern Texas. It is now restricted to south Florida, an area of poor deer and panther habitat, but the last large roadless area available in its range. Problems associated with roads -- roadkill, development, and illegal shooting -- are now driving it to extinction. A population viability analysis has determined an 85% probability of extinction in 25 years, and a mean time to extinction of 20 years. Proposed management interventions still yield 75% to 99% probabilities of extinction within 100 years.

Recently, Seminole Chief James Billie shot a panther with a shotgun from his pickup truck in the Big Cypress Swamp, ate it, and claimed this murder was a native religious ritual. Billie eventually won his case, not on religious grounds, but because taxonomists could not prove beyond all reasonable doubt that the skull found in Billie's possession was that of a Florida panther, Felis concolor subspecies coryi (the various subspecies of cougar differ little from one another in morphology).

Biologists agree that the only hope for the panther is reestablishment of populations elsewhere within its historic range. But is there anywhere with low enough road density to be safe? The best opportunity seems to be the 1.2 million acres in and around Okefenokee National Wildlife Refuge in southern Georgia and Osceola National Forest in north Florida, recently connected by purchase of Pinhook Swamp and its transfer to the Forest Service. Experimenters testing the feasibility of panther reintroduction in this area released five neutered and radio-collared Texas cougars, a subspecies closely related to F.c. coryi, into this habitat. Within a month, one cat died of unknown causes. Two more cats were killed by hunts soon thereafter. The final two cats discovered livestock (a goat pasture and an exotic game reserve), and were

removed from the wild. This setback in the panther reintroduction program demonstrates that even one of the wildest areas in the southeast is still far too human-accessible for panthers to survive. Except for the wettest part of the Okefenokee Swamp, the poorest panther habitat, the area is riddled with roads and swarming with gun-toting "Crackers" and their hounds.

Other large mammals that suffer from road access include cougars (western version of F.c.) and grizzly bears. A radio-telemetry study in Arizona and Utah, by Van Dyke and co-workers, found that cougars avoided roads (especially paved and improved dirt roads) whenever possible, and established home ranges in areas with the lowest road densities. In southeastern British Columbia, McLellan and Mace found that a disproportionate amount of grizzly bear mortality occurred near roads. Of 11 known deaths, 7 bears were definitely shot and another 3 were probably shot from roads. Dood and co-workers found that 32% of all hunting mortality and 48% of all non-hunting mortality of grizzlies in Montana occurred within one mile of a road. Knick and Kasworm recently found that illegal shooting was the primary cause of death for grizzlies in the Selkirk and Cabinet-Yaak ecosystems, and concluded that the ability of regions to maintain viable populations of grizzly bears is related to road density and human access.

Road access imperils black bears, too. In the Southern Appalachians, Mike Pelton has estimated that bears cannot maintain viable populations when road density exceeds .8 miles of road per square mile. Later studies found that the situation is more complicated, and is related to traffic volume and other road use factors. The primary effect of roads on bears in the southern Appalachians is to expose them to increased hunting. Hunting with the aid of trained hounds is the major source of mortality for bears in this region, including within national parks and other sanctuaries, and is encouraged by the trade in bear gall bladders to the Oriental market.

The problem of road access and overhunting is often attributed to inadequacies of human ethics and law enforcement, rather than to any effect of the road themselves. But as Richard Thiel pointed out, in discussing the gray wolf in northern Wisconsin, "Ultimately, the survival of wolves will depend on a change in human attitudes. Until then road densities are important in determining whether an area can sustain a viable population of wolves." We may have to wait a long time before attitudes toward nature improve, but roads can be closed today.

Other consequences of road access include overcollecting of rare plants (e.g., cacti, orchids, and ginseng) and animals (e.g., snakes for the pet trade), the removal of snags near roadsides by firewood cutters, and increased frequency of fire ignitions. Removal of snags eliminates habitat for the many cavity-nesting and roosting birds and mammals. In the Blue Mountains of eastern Oregon and Washington, for example, 39 bird and 23 mammal species use snags for nesting or shelter. Woodpeckers are among the cavity-nesting

birds known to be critically important in dampening forest insect outbreak. Thus, snag removal along roadsides is an anthropogenic edge effect that may have far-reaching effects on entire ecosystems.

Humans are suspected to cause at least 90% of wildfires in the US, over half of which begin along roads. In 1941, Shaw and co-workers reported 78% of all anthropogenic fires occurred with 265 feet of a road. In New Jersey, the origins of 75% of all forest fires were traced to roadsides.

Although fire is a natural process with beneficial effects on many ecosystems, natural fires and anthropogenic fires differ in many ways. One important difference is frequency; anthropogenic fires may occur more frequently than the natural fire return interval for a given ecosystem type. Another important difference is seasonality. In Florida, for example, most anthropogenic fires occur in winter, whereas natural lightning fires occur in late spring and summer. Research in longleaf pine-wiregrass communities, which under natural conditions experience low-intensity ground fires at 2 to 5 year intervals, has determined that summer fires promote higher herbaceous plant diversity and flowering. Winter fires caused by humans tend to promote monotonous, shrub-dominated (e.g., saw palmetto) communities. It is a curious contradiction that the US Forest Service often justifies high road densities as necessary to provide fire control, when in fact most fires begin along roads.

Of the disturbances promoted by road access, perhaps the most devastating is development. Highways introduce pressures for commercial development of nearby land. Highway interchanges inevitably become nodes of ugly commercialism. Arterial streets encourage commercial strip development, and new rural and suburban roads bring in commercial, industrial, and residential development. Internationally funded road-building in third world countries introduces hordes of immigrants, who quickly cut and burn the native forest. In Brazilian Amazonia, Philip Fearnside reported that road development funded by the World Bank facilitates the entry of settlers whose land claims (established by clearing the forest) justify building more roads. Thus, roads and deforestation interact in a positive feedback relationship. Roads bring settlement and development which in turn call for more roads.

Cumulative Effects

So far, this article has discussed effects of roads mostly in isolation from one another. Indeed, almost all research on road problems has looked at one factor at a time, be it lead pollution, roadkill, edge effects, or access. In real ecosystems, however, these factors interact in complex ways, with long-term effects at several levels of biological organization.

To illustrate the complexity of possible impacts, consider this scenario: A network of roads is built into prime gray wolf habitat in northern hardwoods forest. Hunters flock into the area, depressing the wolf

population. Some wolves are killed by vehicles. Eventually, the wolf becomes extinct in this region. In the absence of wolf predation, and with the abundance of brushy roadside edge habitat, the white-tailed deer population explodes. Fires started by humans along roadsides create even more deer habitat. Hunters and vehicles take some deer, but they cannot keep up. The burgeoning deer population overbrowses the forest, eliminating regeneration of favored eastern hemlock, arbor vitae, Canada yew, and a number of rare herbaceous plants. As a result, the floristic composition and vegetation structure of the forest gradually change. With reduced understory density due to heavy browsing, many warblers and other forest songbirds undergo serious declines. With wolves gone, opportunistic medium-sized mammals ("mesopredators") such as opossums and raccoons increase in abundance and feed on the eggs and nestlings of songbirds, many of which nest on or near the ground, further depressing their numbers. Brown-headed cowbirds parasitize these beleaguered songbirds within 200 meters or so of road edges. Cutting of snags for firewood along the roadsides decimates cavity-nesting bird populations. Populations of insect pests now cycle with greater amplitude, resulting in massive defoliation. The roads also bring in developers, who create new residential complexes, and still more roads. Roadside pollutants from increased traffic levels poison the food chain. The original forest ecosystem has been irretrievably destroyed.

This scenario is fictitious, but every part of it has been documented somewhere. Because many of the animal species most sensitive to roads are large predators, we can expect a cascade of secondary extinctions when these species are eliminated or greatly reduced. Recent research confirms that top predators are often "keystone species," upon which the diversity of a large part of the community depends. When top predators are eliminated, such as through roadkill or because of increased access to hunters, opportunistic mesopredators increase in abundance, leading to declines of many songbirds and ground-dwelling reptiles and amphibians. In the tropics, predator removal can lead to an increased abundance of mammals that eat large-seeded plants, which in turn may result in changes in plant community composition and diversity (see John Terborgh's article, "The Big Things that Run the World," reprinted in Earth First!, 8-89).

Other keystone species may be similarly vulnerable to roads. The gopher tortoise of the southeastern US, for example, digs burrows up to 30 feet long and 15 feet deep. By a recent count, 362 species of commensal invertebrates and vertebrates have been found in its burrows, and many of them can live nowhere else. Yet, the slow-moving gopher tortoise is extremely vulnerable to roadkill on the busy highways of this high growth region. Roads also provide access to developers and poachers, the tortoise's biggest enemies. But the effects of roads on gopher tortoises can be more subtle. Good gopher tortoise habitat is longleaf pine-wiregrass, which requires frequent summer fires to maintain its open structure. Although, as discussed above, many fires are ignited along roadsides, the net effect of roads on this

habitat has been to stop the spread of fires that once covered areas the size of several counties. Those roadside fires that do ignite are mostly winter burns, which are less effective in controlling shrub invasion. As shrubs, oaks, and other hardwoods overtake this ecosystem, they shade out the herbaceous plants upon which the herbivorous gopher tortoise depends.

The net, cumulative effect of roads is to diminish the native diversity of ecosystems everywhere. Habitats in many different places around the world are invaded by virtually the same set of cosmopolitan weeds. Regions gradually are homogenized -- they lose their "character." Every place of similar climate begins to look the same, and most ecosystems are incomplete and missing the apex of the food chain. The end result is an impoverishment of global biodiversity.

What Can Be Done

Mitigation

The traditional response of public agencies to road-wildlife conflicts, in those rare instances when they do respond, is "mitigation," i.e., build the road but design it so as to minimize its impacts. For example, barren roadsides can be planted and stabilized by wire netting in order to reduce erosion, landslides, and sedimentation of streams. Stream culverts can be designed to minimize disruption of flow and bed morphology. New roads can be located, and existing roads relocated, outside of critical wildlife habitats (such as moist meadows, shrub fields, riparian zones, and other grizzly bear feeding areas). Speed bumps and warning signs can be installed to slow down motorists and reduce roadkill. Reflective mirrors along roadsides and hood-mounted ultrasonic whistles are devices intended to warn animals of approaching death-machines, but are still of unproven benefit.

Road rights-of-way can be managed to maximize their potential as native wildlife habitat and dispersal corridors. If wide swaths of old-growth longleaf pines are maintained along highway ROWs in the Southeast, for example, they may serve to connect isolated red-cockaded woodpecker populations. Such corridors were recommended by a committee of the American Ornithologists' Union. Some evidence suggests that red-cockaded woodpeckers may indeed disperse along such corridors, but not across long expanses of unsuitable habitat. The management of "roadside verges" for fauna and flora has a long history in Britain, as reviewed by J.M. Way in 1977.

Undoubtedly, mitigation measures, if implemented intelligently, can reduce the harmful effects of roads on wildlife. A 1982 report by Leedy and Adams, for the US Department of Transportation and Fish and Wildlife Service, summarizes a variety of design and construction options to mitigate the effects of roads. For reducing roadkills, a combination of fencing and underpasses has proven effective in many instances.

Tunnels under roads were used as early as 1958 in the United Kingdom to reduce roadkill of badgers, and have been used in several countries to reduce roadkill of amphibians (many frogs, toads, and salamanders migrate to their breeding ponds on wet spring nights). Toad tunnels were constructed as early as 1969 in Switzerland, and have been built throughout much of the United Kingdom, West Germany, the Netherlands, and other countries under the auspices of the Fauna and Flora Preservation Society and Herpetofauna Consultants International. A private firm, ACO Polymer Products Limited, even specializes in the design and production of amphibian tunnel and fencing systems (see Defenders 10-89).

In Colorado, underpasses and deer-proof fencing were constructed on I-70, to channel movement of mule deer along a major migratory route, and have proved fairly successful. D.F. Reed and co-workers, however, found that many individual deer were reluctant to use a narrow underpass (3 meters wide and high, and 30 meters long), and recommended that underpasses be significantly wider. Biologists in various western states are experimenting with one-way gates that keep most deer off the highway but allow deer that get into the highway ROW to escape. In southeastern Australia, Mansergh and Scotts constructed a funnel-shaped rocky corridor and two tunnels of .9 X 1.2 meters each beneath a road that bisected the breeding area of the rare mountain pygmy-possum (the only marsupial hibernator known). The design proved very successful in restoring natural movement and breeding behavior of the pygmy-possums. One of the more controversial applications of the underpass strategy has been in south Florida, for the sake of the Florida panther. As noted above, roadkill is the leading known cause of death for this subspecies. Thus, when an extension of I-75 through the Everglades-Big Cypress Swamp was proposed, conservationists reacted with alarm. When assured by highway and wildlife officials that the new interstate would include fences and underpasses for panthers, making it much less dangerous than the infamous panther-smashing Alligator Alley which it would replace, many conservationists (including the Florida Audubon Society and the Sierra Club) came out in support of the new road.

How effective will these underpasses be in allowing for movement of panthers and other wildlife? Eighty-four bridges are being constructed on the 49 miles of new I-75 in Collier county, 46 of them designed solely for wildlife movement. Each of these "wildlife crossings" consists of three 40-foot spans, for a total length of 120 feet with 8 feet of vertical clearance. Much of the 120 feet will be under water, however, at least in the wet season. There is no guarantee that these crossings will be functional for panthers and other large mammals. Even Thomas Barry, the project manager for the Florida Department of Transportation, admits that the ideal solution would have been to build a viaduct (elevated highway) across the entire stretch, but that this solution was deemed too expensive. As advocated by Florida Earth First!, the "ideal solution" would be to close Alligator Alley and all other roads in the Everglades-Big Cypress bioregion, and to allow no new roads. The desirability of this solution became more evident when we learned that the new I-75 will include recreational access sites for ORVs, as recommended by the

Florida Game and Fresh Water Fish Commission.

The Preferred Alternative

In evaluating various mitigation options for road-wildlife problems, it must be remembered that each is a compromise, addresses only a subset of the multiple ecological impacts of roads, and is far less satisfactory than outright road closure and obliteration. The serious conservationist recognizes that mitigation options should be applied only to roads already constructed, and which will be difficult to close in the near future (i.e., major highways). In such cases, construction of viaducts over important wildlife movement corridors (as documented by roadkills) and other critical natural areas should be vigorously pursued. Amphibian tunnels and other smaller underpasses also should be constructed where needed. But the bottom line is that no new roads should be built, and most existing roads -- especially on public lands -- should be closed and obliterated. This is the preferred alternative!

A priority system for determining which roads should be closed first is necessary to guide conservation actions toward the most deserving targets. The Grizzly Bear Compendium (Lefranc et. al. 1987, pp. 145-46) specifies which kinds of roads should be closed on public lands to protect grizzlies: Access roads should be closed after harvesting and re-stocking, temporary roads and landings should be obliterated, collector roads and loop roads should be closed in most instances, local roads should be closed within one season after use, and seismic trails and roads should be closed after operations have ceased. Bear biologist Chuck Jonkel has long recommended an aggressive road closure program on public lands. Public education on the rationale for closures, and strong law enforcement, must accompany road closure programs if they are to be effective. The Grizzly Bear Compendium recommends that road use restrictions, such as seasonal closures of roads in areas used only seasonally by bears, be placed on roads that cannot be permanently closed.

In a series of publications, I have recommended that large core areas of public lands be managed as roadless "wilderness recovery areas" (a concept attributable to Dave Foreman). Buffer zones surrounding these core areas would have limited access for recreation and other "multiple-use" activities consistent with preservation of the core preserves. Buffer zones also would insulate the core areas from the intensive uses of the humanized landscape. These large preserve complexes would be connected by broad corridors of natural habitat to form a regional network.

As Keith Hammer has documented, however, road closures that appear on paper may not function as such on the ground. Keith found that 38% of the putative road closures on the Flathead National Forest in Montana would not bar passenger vehicles. The road miles behind the ineffective barriers represented 44%

of the roads reported by the Forest Service as being closed to all motorized vehicles year-round. Gates, earthen berms, and other structures are not usually effective in restricting road use. This is especially true in more open-structured habitats, such as longleaf pine and ponderosa pine forests, where motorists can easily drive around barriers. It may be that the only effective road closures are those where the road is "ripped" and revegetated.

The Forest Service and other public agencies will claim that road closures, revegetation, and other restorative measures are too expensive to be implemented on a broad scale. But much of the approximately $400 million of taxpayers' money squandered annually by the Forest Service on below-cost timber sales goes to road-building. Road maintenance is also expensive. Virtually all of this money could be channeled into road closures and associated habitat restoration. This work would be labor-intensive, and providing income to the many laid off loggers, timber sale planners, and road engineers -- for noble jobs, rather than jobs of destruction! Likewise, the huge budgets of federal, state, and county highway departments could be directed to road closures and revegetation, as well as viaducts and underpasses to minimize roadkill on roads kept open.

We cannot expect our public agencies to shift to a more enlightened roads policy without a fight. A lot of people make a lot of money designing and building roads, and exploiting the resources to which roads lead. Nor can we expect the slothful, ignorant populace to give up what they see as the benefits of roads (fast transportation, easy access to recreational areas, scenery without a sweat, etc.) for the sake of bears and toads. Education of the public, the politicians, and our fellow environmentalists about the multiple and far-reaching impacts of roads is critical. As Aldo Leopold noted, "recreational development is a job not of building roads into lovely country, but of building receptivity into the still unlovely human mind." The greatest near-term need is direct action in defense of existing roadless areas, and to close roads where they are causing the most problems for native biodiversity.

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Parks and Natural Resources Division

DATE: APRIL 25, 2007

TO: PLANNING COMMISSION

FROM: KATHY WOODS, ADMINISTRATOR

SUBJECT: AMENDMENT TO THE HAHAMONGNA WATERSHED PARK MASTER PLAN

RECOMMENDATION:
It is recommended that the Planning Commission recommend the following to the City Council:

1. Conceptually approve the amendments to the Goals and Objectives of the Hahamongna Watershed Park Master Plan to reflect the community's vision for the 30-acre Hahamogna Annex property (See Commissioner Handbook);
2. Conceptually approve the recommended Proposed Uses and the Proposed Uses Concept Plan for the Hahamongna Annex (Attached and in Handbook);
3. Conceptually approve the amendment of the following in the September 29, 2003 adopted Hahamongna Watershed Park Master Plan:
    a) Eliminate the project entitled "Equestrian Staging Area" with its related road realignment and parking improvements and instead keep this location a group picnic area with an improved park road for safe access for two-way traffic;
    b) Revise the Hahamongna Watershed Park Master Site Plan to include the addition of the Hahamongna Annex area and its proposed uses; and
    c) Revise the Bicycle Route plan of the Hahamongna Watershed Park Master Plan.

BACKGROUND
On September 29, 2003, the City Council adopted the Hahamongna Watershed Park (HWP) Master Plan, one of the Arroyo Seco Master Plans. The Arroyo Seco Master Plans comprise a set of four separate planning documents (Lower Arroyo Master Plan, Central Arroyo Master Plan, HWP Master Plan, and the Arroyo Seco Design Guidelines) that portray a community vision for one of the region's most valued resources, the Arroyo Seco. The creation of the Arroyo Seco Master Plans is the result of a broad-based community efforts.

The adopted HWP Master Plan covers the lower 300 acres of the total 1300 acres comprising the Upper Arroyo Seco. Hahamongna Watershed Park is bounded on the north by the Angeles National forest and to the east by the community of Altadena. It is bounded on the south by the Foothill Freeway and Devil's Gate Dam and to the west by the City of La Canada Flintridge.

The Hahamongna Annex property is a 30-acre property immediately adjacent to the northwest border of Hahamongna Watershed Park in the Upper Arroyo Seco. (See Exhibit 5). In October 2005, the property was purchased by the City from the Metropolitan Water District (MWD) for a purchase price of $1.2 million. The site is being referred to as the Hahamongna Annex. A condition of the sale of the Hahamongna Annex placed an Open Space Easement across the entire property and stipulates that the property shall be used for Open Space, Park and Recreation purposes. An additional condition of sale required the City to honor the existing leases (Los Angeles County Fire and Rose Bowl Riders) on the site.

PROJECT OVERVIEW

Until recently, the Hahamongna Annex property contained three tenants: The Oak Grove Station of the U.S. Forest Service (seven acres), Los Angeles County Fire Camp 2 (six acres) and Rose Bowl Riders (12 acres). The U.S. Forest Service terminated its lease just prior to the City's purchase and is no longer on the property. The County Fire Camp has a fifty-year lease on its site, which was renewed in 2003 and is being honored by the City as a condition of the sale from the MWD. The US Forest Service Ranger Station, which has now been abandoned, offers the most significant opportunity for future uses. The lease with the Rose Bowl Riders is a year-to-year lease that expires annually at the end of October; RBR has subleases with two additional tenants: Tom Sawyer Camps and MACH1 (Move A Child Higher). Additional information about the current tenants can be found in the Commissioner Handbook. The site also contains a one-acre easement with Jet Propulsion Laboratory and four acres of common area consisting of the park roadway, slopes with oak woodland, and trails.

A variety of buildings are in existence on the vacated U.S. Forest Service grounds and a variety of equestrian-related facilities on much of the remaining site. The "Celebration and Open House" brochure provides a description of the existing facilities. (See Commissioner Handbook).

The Department of Public Works, Parks & Natural Resources Division, began a planning process for the Hahamongna Annex in January 2006 with the assistance of the National Park Service, Rivers, Trails and Conservation Assistance (RTCA) Program. The City was a recipient of a technical assistance grant from the National Parks Service, Rivers, Trails and Conservation Assistance(RTCA) Program, whereby assistance with community meeting facilitation as well as technical/planning assistance was provided for the project. The primary objectives in embarking on this planning process were to:

1. Develop a community vision for the Hahamongna Annex;
2. Create a seamless plan for this part of the Arroyo Seco that merges the 30-acre Annex site with the already adopted 300-acre Hahamongna Watershed Park Master Plan area.

A proposal for the future of this new public land is now recommended, based on the public planning process completed to date. The following community meetings took place on this project and a summary of these meetings is in the Commissioner Handbook along with a summary of the community input received through midsummer 2006:

April 6, 2006 – 1st Community Workshop: Presentation of Data Collection and Research/General Community Feedback

May 4, 2006 – 2nd Community Workshop: Develop Planning Framework

May 18, 2006 – 3rd Community Workshop: Complete Development of Planning Framework

May 20, 2006 – Design Charrette with approximately 36 invited participants

June 20, 2006 – 4th Community Workshop: Share Charrette Results/General Feedback about the Charrette Results

A proposal for the future of this new public land is now recommended based on the information and feedback received through the public planning process described above. The plan proposed for conceptual approval is a combination of equestrian-themed uses and an environmental education center. This is detailed as follows: A horse boarding area; a public equestrian activity and event area operated by Rose Bowl Riders and comprised of 3.6 acres of land; an therapeutic equestrian area; and a youth camp equestrian area. The environmental education and community meeting center, comprised of 5.63 acres is proposed for the area formerly occupied by the United States Forest Service. The plan also includes maintaining the existing Los Angeles County Fire Camp 2 and calls for restoration of 2.86 acres of oak habitat (see attached Proposed Uses Concept Plan).

The Environmental Education and Community Meeting Center will be developed within building previously occupied by the U.S. Forest Service. The building locations will make an ideal location for study of the ecology, biology, geology, and the various watershed issues of this area. The City has received a proposal from Pasadena City College indicating a desire to utilize this site for the college's new interdisciplinary Environmental Studies Program that begins in Fall 2007. In addition, the City has discussed the development of community meeting and classrooms that the Los Angeles County Fire Department and Jet Propulsion Laboratory (JPL) have both shown and interest in for future use.

The proposed uses will fill a need for public equestrian facilities, development of an environmental education center and restoration of critical habitat within the area.

Since the summer of 2006, staff has:

- Conducted research on similar facilities within a public park setting
- Sought the expertise of an equestrian facility designer
- Met with various City departments on the both the lease, management and operational issues associated with a public equestrian facility
- Met with all the tenants on several occasions to attempt to reach a mutual consensus

FISCAL IMPACT

Upon adoption of the Amendment to the Hahamongna Watershed Park Master Plan, staff will prepare cost estimates and priorities.

Respectfully submitted,

Kathleen Woods, Administrator
Parks and Natural Resources Division

Prepared By:

Rosa Laveaga, Landscape Architect
Arroyo Seco Project Supervisor
Parks and Natural Resources Division

Reviewed By:

Martin Pastucha, Director
Department of Public Works