

Members

Diane Dillon
Mark Luce
David Graves
Jeff Reichel
Phill Blake
Donald Gasser
Kate Dargan
Jeffrey Redding
Tom Shelton
Charles Slutzkin
Carol Kunze
Richard Camera

Alternates

Harold Moskowitz
Karen Slusser

AGENDA

REGULAR BOARD MEETING

Thursday, May 26, 2005 at 4:00 p.m.
2nd Floor Conference Room, Hall of Justice Building,
1125 Third Street, Napa CA

Staff Representatives

Patrick Lowe,
Secretary
Deputy Director,
Conservation Div., CDPD

Jeff Sharp,
Watershed Coordinator
Planner III,
Conservation Div., CDPD

Laura Anderson,
Counsel
Attorney IV,
County Counsel's Office

1. **CALL TO ORDER & ROLL CALL** (Chairman)

2. **APPROVAL OF ACTION MINUTES**

Regular meeting of March 24, 2005 and special meeting of May 9, 2005 (Chairman)

Note: Due to lack of quorum, the Board's regular meeting of April 28, 2005 was adjourned by the Secretary. All items of business before the WICC Board on April 28, 2005 will be heard during this, May 26, 2005, meeting.

3. **PUBLIC COMMENT**

In this time period, anyone may comment to the Board regarding any subject over which the Board has jurisdiction, or request consideration to place an item on a future Agenda. No comments will be allowed involving any subject matter that is scheduled for discussion as part of this Agenda. Individuals will be limited to a three-minute presentation. No action will be taken by the Board as a result of any item presented at this time. (Chairman)

4. **ANNOUNCEMENTS** (Board/Staff)

5. **UPDATES/REPORTS:**

- a. Update on the Board's **Strategic Planning Workshop, held May 9, 2005** and expected timeline for Strategic Plan update (Staff)
- b. Update on activities of the **Napa County Parks and Open Space Advisory Committee** (Staff/Cheryl Harris, Committee Representative)
- c. Update on **Napa River Steelhead Biogenetics Study** underway with assistance from the Army Corp of Engineers, Stillwaters Sciences, RCD and others (Staff)

6. **PRESENTATION, DISCUSSION AND REQUEST FOR COMMENT:**

Presentation, discussion and request for comments on one or more of the following draft sections prepared for the Napa County **Baseline Data Report (BDR): Agriculture Resources, Land Use, Visual Resources, Transportation and Circulation, and Fire Ecology** (Staff/Jones & Stokes/EDAW)

7. **PRESENTATION, DEMONSTRATION AND DISCUSSION**

Presentation, demonstration and discussion on **Hyperspectral Imaging** and its application in watershed analysis based on a Colorado Springs pilot project (Staff/Brian Collins, Bill Mills and David Blankinship, project leaders/Kate Dargan, Napa County Fire)

8. **FUTURE AGENDA ITEMS** (Board/Staff)

- a. Final BDR elements for Board review and comment
- b. Others

9. **NEXT MEETING – Regular Board Meeting of June 23, 2005 – 4:00 PM**

Hall of Justice Building, 2nd floor Conference Room, 1125 Third Street, Napa

10. **ADJOURNMENT** (Chairman)

If requested, the agenda and documents in the agenda packet shall be made available in appropriate alternative formats to persons with a disability. Please contact Jeff Sharp at 707-259-5936, 1195 Third St., Suite 210, Napa CA 94559) to request alternative formats.



Members

Diane Dillon
Mark Luce
David Graves
Jeff Reichel
Phill Blake
Donald Gasser
Kate Dargan
Jeffrey Redding
Tom Shelton
Charles Slutzkin
David Crawford
Eric Knight
Carol Kunze
Richard Camera

Alternates

Harold Moskowite
Karen Slusser

Staff Representatives

Patrick Lowe,
Secretary
Deputy Director,
Conservation Div., CDPD

Jeff Sharp,
Watershed Coordinator
Planner III,
Conservation Div., CDPD

Laura Anderson,
Counsel
Attorney IV,
County Counsel's Office

- MINUTES / ACTION SUMMARY -

REGULAR BOARD MEETING

Thursday, March 24, 2005 at 4:00 p.m.
2nd Floor Conference Room, Hall of Justice Building,
1125 Third Street, Napa CA

1. **CALL TO ORDER & ROLL CALL** (Chairman)

Members Present: Diane Dillon, David Graves, Jeff Reichel, Phill Blake, Donald Gasser, Kate Dargan, Charles Slutzkin, Carol Kunze, Richard Camera

Members Absent Excused: Mark Luce, Jeffrey Redding, David Crawford, Eric Knight,

Members Absent: Tom Shelton

Staff Present: Patrick Lowe, Jeff Sharp

2. **APPROVAL OF ACTION MINUTES**

Meeting of February 24, 2004 (Chairman)

Outcome: Approved as presented.

3. **PUBLIC COMMENT**

In this time period, anyone may comment to the Board regarding any subject over which the Board has jurisdiction, or request consideration to place an item on a future Agenda. No comments will be allowed involving any subject matter that is scheduled for discussion as part of this Agenda. Individuals will be limited to a three-minute presentation. No action will be taken by the Board as a result of any item presented at this time.

Outcome: None received.

4. **ANNOUNCEMENTS** (Board/Staff)

Outcome: Informational.

Carol Kunze announced opening of the comment period for the Lake Berryessa Visitors Service Plan and handed out Bureau of Reclamation brochure.

Diane Dillon announced a public workshop sponsored by the Sacramento Watershed Program on developing watershed health indicators, to held on March 30, 2005. WICC staff will attend the workshop.

Kate Dargan announced that there will be a Firewise forum on May 13, 2005 at the Napa County Library.

Staff announced that the Chair (Charles Slutzkin), Vice Chair (Kate Dargan) and staff will be attending the County's Committees and Commissions Training Workshop on March 31, 2005

Staff also announced a water quality conference offered in Redding CA on April 26, 2005, and a workshop series available through the California Department of Conservation and the California Association of Resource Conservation Districts at various times and places northern California in April 2005.

Diane Dillon announced a proposed assembly bill that would create a Central Valley assessment district to pay for delta levy repairs and maintenance authored by Governor and Laird AB1665

5. UPDATES/REPORTS:

- a. Update on **Watershed Awareness Month – May 2005** (Staff/RCD)
 - i. **Event poster** development

Outcome: Staff announced the Event Poster is designed ready to go to print in coming week.

- ii. County Board of Supervisor's **proclamation**

Outcome: Staff reported that the County Board of Supervisors, on May 3, 2005, will proclaim May 2005 as Watershed Awareness Month in Napa County.

- iii. WICC website feature and **public launch/mail-out**

Outcome: Staff reported that a WICC WebCenter feature will be displayed on the WICC homepage and a garbage bill insert is being developed to promote the WICC WebCenter's Public Launch and the host of watershed events happening throughout the month of May.

- b. Update on status of County **Board of Supervisor's resolution granting** the Director of Conservation, Development and Planning limited **authority to apply for watershed grants** to support the mission of the WICC Board (Staff)

Outcome: The County Executive Office staff analysts are reviewing the request, which is scheduled for the County Board of Supervisors' April 5, 2005 meeting. Approval of the request by the County Board will allow the WICC Board, through the authority of the Planning Director, the ability to apply for certain watershed related grants in a shorter procedural timeline.

- c. Update and reminder of Board's **Strategic Planning Workshop, May 9, 2005, 8:30am – 1:30pm** (Staff)

Outcome: A reminder of the workshop time and place was given.

d. Update on available **grant opportunities** (Staff)

Outcome: Staff outlined a number of grants/programs that were recently funded (Army Corp of Engineer's "Napa Valley Watershed Resources Analysis" Salmon Biogenetics Study and the AWQGP submittal recommended for funding) and other grant opportunities that are currently available or on the horizon (DFG Fisheries Restoration Program and Calfed Watershed Program).

Kate Dargan brought up the technology of Hyperspectral Imaging and the possible opportunities that may exist for grant monies associated with its application here in Napa County. It was suggested that a future presentation of the technology be given to the Board.

6. **UPDATE, DISCUSSION AND REQUEST FOR COMMENT:**

Update on Baseline **Data Report (BDR) progress and delivery schedule**, discussion of currently available draft elements and request for Board comment (Staff/Jones & Stokes/EDAW)

Outcome: Staff updated the Board on the BDR delivery schedule. Four or more elements of the BDR will come before the Board at their next meeting, which will include a presentation on the one or more key areas of interest (i.e., agriculture and/or land use). Other presented elements will be hosted on the WICC WebCenter. Additional technical reviews will be happening concurrently with county staff and external agencies. A majority of the elements will be viewed by the WICC Board in the months of April and May. The BDR project should wrap-up in the month of June with Hydrology (modeling) element(s) being the last completed. Final elements of the BDR will be discussed with the General Plan Committee and/or the Board of Supervisors in July and August.

A TMDL update will be presented by RWQCB staff at the WICC Board's April 28, 2005 meeting. A draft of the sediment TMDL is expected in mid-April.

Don Gasser (and others) expressed concern that the wildlife movement (corridors) analysis presented for the BDR Biology section during the Board's February meeting did not reflect the true ability of animals to travel "on the ground." It was explained that the mapping presented was a "path of least resistance" analysis and not a true wildlife corridor. The mapping did show the greatest opportunities available for the establishment of wildlife corridors. The localized affects of fencing that creates a barrier to wildlife was not considered in the wildlife movement scenarios conducted for the BDR Biology section. There was further discussion by the Board on the issues of fencing and wildlife. The Board suggested the community would benefit from a better understanding of the application, role and technology of today's fencing, including how fencing affects wildlife and property.

7. **PRESENTATION AND DISCUSSION**

Presentation and discussion on **coordinated permitting and incentives for stream restoration and enhancement**, facilitated by the USDA Natural Resource Conservation Service (NRCS) (Staff/NRCS)

Outcome: Phill Blake and Daniel Mountjoy of the Natural Resource Conservation Service presented the Board with an overview of stream restoration permitting process and a "stream-lined" coordinated permitting approach being explored in other areas of California. Various models of "coordinated" permitting were also presented. The Board recognized a local need for coordinated permitting and encouraged that the topic be brought up during its Strategic Planning Workshop on May 9, 2005 as a potential priority for the Board's consideration.

8. **FUTURE AGENDA ITEMS** (Board/Staff)

- a. Napa River TMDL update from Regional Water Quality Control Board staff

Outcome: A TMDL update will be presented by RWQCB staff at the WICC Board's April 28, 2005 meeting.

- b. Additional BDR elements for Board review and comment

- c. Others

9. **NEXT MEETING**

April 28, 2005, 4:00PM

Hall of Justice Building, 2nd floor Conference Room, 1125 Third Street, Napa

10. **ADJOURNMENT** (Chairman)



Members

Diane Dillon
Mark Luce
David Graves
Jeff Reichel
Phill Blake
Donald Gasser
Kate Dargan
Jeffrey Redding
Tom Shelton
Charles Slutzkin
Carol Kunze
Richard Camera

Alternates

Harold Moskowitz
Karen Slusser

Staff Representatives

Patrick Lowe,
Secretary
Deputy Director,
Conservation Div., CDPD

Jeff Sharp,
Watershed Coordinator
Planner III,
Conservation Div., CDPD

Laura Anderson,
Counsel
Attorney IV,
County Counsel's Office

- MINUTES / ACTION SUMMARY -

SPECIAL BOARD MEETING

Strategic Planning Workshop

Monday, May 9, 2005 at 8:30 a.m.
Joseph Phelps Winery, 200 Taplin Road,
St. Helena, CA

1. **CALL TO ORDER & ROLL CALL** (Chairman)

Members Present: Diane Dillon, David Graves, Jeff Reichel, Phill Blake, Donald Gasser, Kate Dargan, Charles Slutzkin, Carol Kunze, Richard Camera Tom Shelton, Mark Luce, Jeffrey Redding, Karen Slusser

Members Absent Excused: None

Members Absent: None

Staff Present: Patrick Lowe, Jeff Sharp

2. **APPROVAL OF ACTION MINUTES**

None at this time.

Outcome: None presented

3. **PUBLIC COMMENT**

In this time period, anyone may comment to the Board regarding any subject over which the Board has jurisdiction, or request consideration to place an item on a future Agenda. No comments will be allowed involving any subject matter that is scheduled for discussion as part of this Agenda. Individuals will be limited to a three-minute presentation. No action will be taken by the Board as a result of any item presented at this time.

Outcome: None received.

4. **ANNOUNCEMENTS** (Board/Staff)

Outcome: Kate Dargan announced the May 12, 2005 roll-out of the Napa County Firewise program.

5. **BOARD DISCUSSION AND PARTICIPATION IN A FACILITATED STRATEGIC PLANNING WORKSHOP** (Staff/Consultant)

Outcome: Tina Stott, a consultant with Pacific Municipal Associates' (PMC) Conservation and Resource Planning Group, presented the Board with a Workshop Agenda and working report summarizing the Board Member's responses to earlier telephone interviews conducted by the consultant. Both the agenda and the report assisted the Board with its discussions and planning efforts. Board Members actively participated in facilitated

strategic planning discussions, drawing from the Board's interview/survey responses contained in the prepared report. PMC consultant recorded the Board's deliberations, suggestions and responses throughout the workshop on large display paper(s). At the conclusion of the workshop, the consultant was tasked with charged with providing the Board Meeting Notes and a Draft Vision for its May 26, 2005 meeting. A Draft Strategic Plan will be prepared for the Board's review and consideration at its June 23, 2005 meeting and a Final Strategic Plan is expected for the Board's July 28, 2005 meeting.

6. **FUTURE AGENDA ITEMS** (Board/Staff)

Outcome: Summary of workshop Meeting Notes and a Draft Vision for May 26, 2005 meeting, Draft Strategic Plan for June 23, 2005 meeting and a Final Strategic Plan for the Board's July 28, 2005 meeting.

7. **NEXT MEETING – Regular Board Meeting: May 26, 2005 – 4:00 PM**

8. **ADJOURNMENT** (Chairman)

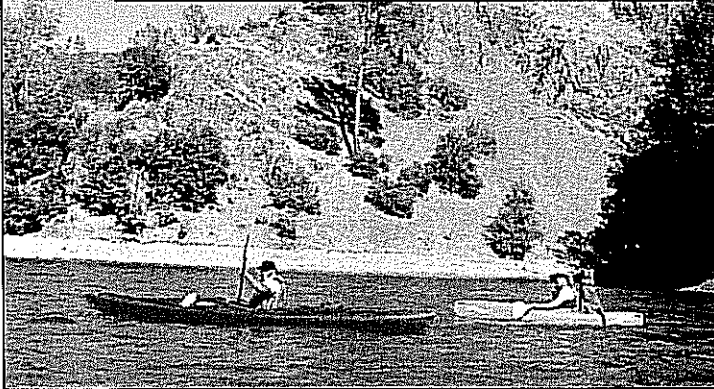
If requested, the agenda and documents in the agenda packet shall be made available in appropriate alternative formats to persons with a disability. Please contact Jeff Sharp at 707-259-5936, 1195 Third St., Suite 210, Napa CA 94559 to request alternative formats.





Napa County Parks and Open Space Advisory Committee

**Interim Report to the Board of Supervisors
December 7, 2004**



**NAPA COUNTY PARKS AND OPEN SPACE COMMITTEE
INTERIM REPORT TO THE NAPA COUNTY BOARD OF SUPERVISORS**

The Need for Parks and Open Space

Napa County has long cherished its rural character and has served as a leader in the regulatory protection of its agricultural and watershed lands. From the creation of the Agricultural Preserve in 1968 to the present day, Napa County has been a leader in the protection of agriculture and by virtue of that protection, watersheds and open space.

Almost as notable, however, is Napa County's lack of regional parks and publicly accessible open space for enjoying nature and pursuing recreational opportunities. Napa is one of only three counties in California that has no county parks department and is the only county in the Bay Area with no open space district. According to the Bay Area Open Space Council, all of our neighboring Bay Area counties dedicate a wide range of funding to regional parks for their local residents to enjoy.

**SAN FRANCISCO BAY AREA
DEDICATED PARKS FUNDING**

Alameda County	\$47,653,000
Contra Costa County	31,316,000
Marin County	4,081,000
Napa County	- 0 -
San Francisco County	23,775,000
Santa Clara County	37,359,000
Solano County	1,067,000
Sonoma County	4,509,000

Napa County demographics have changed dramatically during the last 30 years from a rural county population base to a population that is predominately located in urban areas. We have chosen to concentrate residential growth within our cities as a means of protecting our agriculture lifestyle and rural character. The resulting increasing density in our cities needs to be supported and relieved by increased opportunities to access public land outside our urban centers.

County parks and open space could add substantially to the quality of life for Napa residents by creating opportunities to enjoy the outdoors in solitude or with friends and family, to be in contact with nature, and to engage in hiking, horseback riding, biking and paddling. There is, however, a greater benefit to the entire community. The more access residents have to our natural resources, the greater their interest in protecting our wild lands, habitat, forested lands, watersheds and open spaces. As a smaller and smaller percentage of our population is actively engaged in agriculture, it becomes more and more important that residents have opportunities to access and enjoy public lands in a manner that will foster appreciation and respect for our natural resources.

This appreciation is even more vital to Napa County because the continued protection of our agricultural lands depends upon succeeding generations valuing the natural resources that make Napa special and upon which our agricultural heritage depends.

Formation of the Advisory Committee:

The Napa County Board of Supervisors formed the Napa County Parks and Open Space Committee in August, 2003 with a twofold purpose regarding parks and open space. The Committee was appointed to serve from November 2003 through December 2005 and asked to report back to the Board of Supervisors by December 31, 2004 with a specific set of recommendations on:

- distribution of \$1,200,000 in State Park Bond Act of 2002 (Prop 40) funds allocated on a per capital basis to Napa County, and
- the structure and organization of a park/open space agency.

Work of the Advisory Committee:

The Advisory Committee worked diligently throughout its first year to gather information, conduct research, interview and solicit feedback from the community at large. In addition to monthly Advisory Committee meetings, a working retreat and occasional special meetings, four working groups were formed to accomplish the following:

1. Needs Assessment

This work group sought input by holding public hearings in Napa and St. Helena in April, 2003. Information and guidance was also sought in American Canyon through its existing City Parks and Recreation Commission. Published notices and written invitations to interested organizations and agencies to attend the hearings also encouraged responses from the public at large via the Internet and through the mail to an informal survey. Hikers, cyclists, equestrians, bird watchers and naturalists, as well as representatives of the various organized sports groups, attended the hearings or otherwise provided input.

The verbal response at the public hearings, as well as the survey results demonstrated that there is substantial need in the unincorporated area of Napa County for more opportunities for walking and hiking trails (mirroring the results of a recent State of California parks survey), while recognizing the need for habitat and open space protection and conservation. People want to get out into the natural world to exercise and enjoy nature, but opportunities within the unincorporated area of Napa County are extremely limited. There was strong support for a parks and open space entity to own and manage publicly accessible land.

2. Inventory of Public Lands

This group compiled an inventory of public lands within Napa County, including holdings by Federal, State, and County agencies and municipalities, as well as non-profits such as The Land Trust of Napa County. Included in the inventory is a summary description of the current use of the site, its acreage, state of development and accessibility. This inventory may be found under the Department of Public Works on the Napa County website (www.co.napa.ca.us). Review of the inventory suggests that more than 40,000 acres of public land already owned by public agencies in Napa County are not readily available for recreational use due in part to lack of management resources. These areas are either inaccessible (fenced, or otherwise "off-limits") or undeveloped (no parking, developed trails, or restroom facilities) and their existence is generally by the public!

3. Organizational Structure

The organizational structure group spent a great deal of effort contacting county parks departments and open space districts. Our primary resource was Darla Guenzler of the Bay Area Open Space Council who utilized existing inventory information regarding parks and open space agencies, primarily in the San Francisco Bay Area. In addition, the group contacted all of the entities in Napa County (Cities of Napa, St. Helena, American Canyon, Calistoga, and Town of Yountville) to obtain the park, recreation and/or open space element of their General Plans in order to examine their approach to parks and open space within these communities.

After its initial work, the learning process was expanded to the entire Committee. On July 8, 2004, the Advisory Committee met with David Hansen of the Marin County Open Space District, Bob Doyle of the East Bay Regional Parks District and Sandy Elles of the Napa County Farm Bureau. Sandy was the mayor of Cotati in 1989 when the residents of Sonoma County enacted a 20 year ¼ percent sales tax and created the Sonoma County Agricultural Land and Open Space District. On August 5, a second panel discussion was held with Lisa Kilough of the Santa Clara County Parks Department and Craig Britton on the Mid-Peninsula Regional Open Space District. The panels freely discussed the benefits of creating an Open Space District, which include dedicated funding, staffing and governance, when compared to creating a county parks department, and responded to numerous questions.

Following intensive discussions in the work group and full Committee meetings, including a half day retreat on May 8 devoted to exploring our thoughts and goals for a Napa County parks and open space agency, the following was agreed. The direction of such an agency should be to benefit all Napa County residents of every age and socio economic status, with the priority being the development of more trails and greater access to public lands, while conserving and protecting wildlife habitat. Therefore, the goal of the new entity should be to provide passive recreational opportunities throughout the county, leaving the development and maintenance of more active recreation and sports facilities primarily to each individual city, as was recommended in *Napa County's Park and Recreation Plan* of 1976. In addition, following consultation of those involved in both departments and districts, it was agreed that a *parks and open space district* would best meet the needs of Napa County residents for recreational opportunities and the interest in protecting open spaces.

4. Distribution of Proposition 40 Funding

A fourth group developed a procedure for recommending distribution of the County's \$1.2 million share of the Proposition 40 Per Capita Grant Program. As a starting point, the Committee decided to recommend distribution of the first 25% of the funds (\$300,000) for projects in urbanized areas, according to the cities own priorities. The Committee intends to recommend distribution of the remaining funds (\$906,688) on projects which have unincorporated area or regional significance.

An application form was developed and provided to interested organizations, agencies and cities. With the exception of the town of Yountville, applications were received from organizations or agencies in all of the cities within Napa County.

A second subgroup reviewed and discussed the nine applications that were received. The subgroup's recommendation to fully or partially fund six of the requests was adopted and accordingly, the Committee hereby recommends that \$293,312 be distributed for projects in urbanized areas as indicated in the charts below.

RECOMMENDED DISTRIBUTION				
Submitted by	Project	Amount requested	Total Project Cost	Amount Recommended
Skyline Park Citizen's Association	Bridges	18,312	36,623	18,312
City of St. Helena Community Pool	New pool	25,000	2,709,894	25,000
City of American Canyon	Public access to view marsh habitat	70,000	201,000	70,000
City of St. Helena	City park play equipment	35,000	615,000	35,000
Napa Youth Sports Council	Ball fields at Silverado Middle School	200,000	1,900,000	25,000
City of Calistoga	Stabilizing riverbank for bike path bridge	20,000	55,400	20,000
SUBTOTAL		368,312		193,312
City of Napa	*	100,000		+ 100,000
TOTAL				293,312

REQUESTS & RECOMMENDATIONS BY GEOGRAPHIC AREA		
City	Requested	Recommended
Napa**	*323,312	*143,312
American Canyon	70,000	70,000
St Helena	125,000	60,000
Calistoga	40,000	20,000

* Includes \$100,000 committed to the City of Napa as part of the City-County housing agreement.

** Includes Skyline Park, which is outside city limits.

Financial Feasibility Study by Trust for Public Land

The Trust for Public Land (TPL) is a nationally recognized nonprofit organization whose purpose is the conservation of "land for people". TPL has a Conservation Finance division through which they provide technical information and assistance to local communities. During the November 2002 election, for example, they were involved in thirty-eight local ballot measures related to parks and open space across the country. Thirty of these passed and will generate upwards of \$2.2 billion for parks and land conservation efforts.

TPL has offered, upon Napa County's request, to provide a basic feasibility study of potential parks and open space financing, at no cost to the county. The study will review the county's fiscal capacity, recent funding measures and any other measures in the pipeline, as well as voter and election history. It will provide examples of the level of funding that alternative mechanisms might generate. Based on the results of this demographic, fiscal, legal and election research, TPL's expert staff will help us determine the optimal financing mechanism (e.g., sales tax, general obligation bond, benefit assessment, parcel tax). In short, it will conduct a feasibility study of the revenue side of the equation for creating and maintaining a regional park system. The Advisory Committee recommends that the Board of Supervisors request that TPL undertake this fiscal analysis of Napa County.

Completing our Work

In order to assist us in finishing the details of a parks and open space district proposal, and to move the county toward development of such a district while we do so, the Committee recommends that a full time staff position be created and the mandate of the Committee expanded.

Full time staff position. During the past 15 years, specifically since 1990 and the passage of Proposition 70, Napa County residents have seen funds from successive bond acts go disproportionately to counties that have parks and open space agencies and the professional capability to seek funds. The recent approval of an increase in Napa County's transient occupancy tax provides additional funds to the General Fund that the Board can use for any purpose. This increase in General Fund revenue may provide an excellent opportunity to fund a full-time position to assist in the development and creation of a parks and open space district.

Modest funding that would support creation of a full time professional staff position would assist the Advisory Committee in completing its work and build technical expertise and momentum toward creation of a parks and open space district. Additionally, such a position would allow the county to devote attention to competitive state bond funding, and foundation and grant programs to begin protection of important lands within Napa County. The creation of a full-time parks and open space position would easily accrue net benefits in terms of Napa County receiving competitive funds which would exceed the cost of the position.

The Committee therefore recommends that a full-time professional-level position be created, with appropriate administrative support, dedicated to working on parks and open space issues, including assisting the Advisory Committee to complete its tasks and driving the process to create a parks and open space district to its successful conclusion.

Expanded mandate. Our introduction emphasized that parks and open space are not only a quality of life issue, but vital to ensuring the continued appreciation of our natural resources that is at the heart of our agricultural preserve and rural character.

With this heightened importance in mind, the Advisory Committee recommends that now that the initial data gathering has been completed, our mandate be expanded by the Board to enable us to become engaged in park and open space issues now, and eventually district implementation aspects. In so doing, the Committee will be better placed to complete the work needed to finalize our recommendation and mount a campaign that will ultimately lead to a successful parks and open space district ballot measure.

Toward that end we ask the Board of Supervisors to:

1. Expand the mandate of the Advisory Committee to include:
 - a. development of the details of a District and its formation, including its financing plan;
 - b. development of a conceptual master plan for parks and open space to provide the community with some idea of the benefits and opportunities that a parks and open space district would afford;
 - c. following development of the conceptual plan, recommendation for the distribution of the remaining Prop 40 Napa County per capita allocation;
 - d. pursuit of further grant opportunities with matching revenue, as appropriate;
 - e. provision of input to the Board of Supervisors on parks and open space issues relating to federal, state and local areas of regional recreational interest, including but not limited to, Lake Berryessa, Skyline Park, Bothe-Napa State Park, South Wetlands Opportunity Area, and regional trail organizations such as the SF Bay Trail and the SF Bay Area Ridge Trail;
 - f. community outreach to generate support for a parks and open space district; and
 - g. provision of input on appropriate elements of the General Plan affecting recreational opportunities, parks and open space; and
2. Extend the life of the Parks and Open Space Advisory Committee to the end of 2006.

Conclusion

While the Advisory Committee has made great initial strides, we are even more excited about the potential that we have in the near future to accomplish what has been a dream for Napers over many decades – the creation of a parks and open space district. The Advisory Committee is enthusiastic about moving toward the creation of such a district during the next 24 months and is very committed to making this a reality. We ask for the Board of Supervisor's support and financial commitment to bring this exciting potential to fruition. Thank you once again for your wisdom in creating this opportunity and your ongoing and future support for the successful creation of this district.

HYPERSPECTRAL IMAGING

Endless Possibilities from the Power of Datacubes

By James Ellis, principal, Ellis GeoSpatial (www.ellis-geospatial.com), Walnut Creek, Calif.

A new generation of hyperspectral images is aiding resource management, agriculture, mineral exploration and environmental monitoring applications, to name a few. Hyperspectral sensors differ from multispectral sensors because they measure the intensity of reflected solar energy across a continuous span of wavelengths, recording visible light comprising relatively short blue, green and red wavelengths, as well as longer visible near-infrared (VNIR) and short wave-infrared (SWIR) light.

The airborne hyperspectral sensor collects reflected light as picture elements (pixels). But unlike airborne and satellite multispectral sensors, which use a few detectors that are sensitive to broad wavelength bands of light, hyperspectral sensors subdivide reflected light into ~50 to 200+ discrete and continuous wavelength bands. The large number of spectral bands collected within each pixel or instantaneous field of view (IFOV) is the basis of the name "hyperspectral." Because each pixel has so many bands, a hyperspectral

flight strip often is referred to as a "datacube." Sophisticated image-processing packages, such as Research Systems' ENVI software, can display the datacube and color-code the intensity of reflected light from short to long wavelengths along the cube's edge.

Hyperspectral Specifics

The power of hyperspectral remote sensing is most effectively exploited when individual pixels are analyzed for their spectral characteristics. The amount of energy recorded within each pixel—and the spectral signature—varies across the wavelength range collected by the sensor because different materials on Earth's surface reflect or absorb solar energy to varying degrees. Hyperspectral sensors are unique in that they have sufficient spectral resolution to identify different surface materials based solely on spectral signatures (Figure 1).

Comparing Sensors

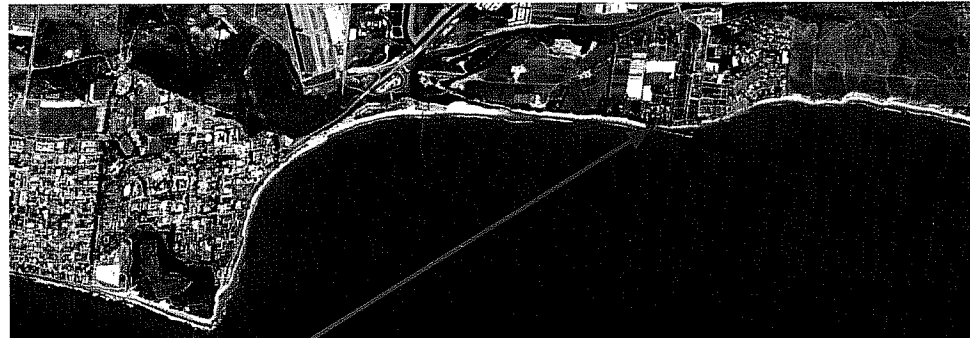
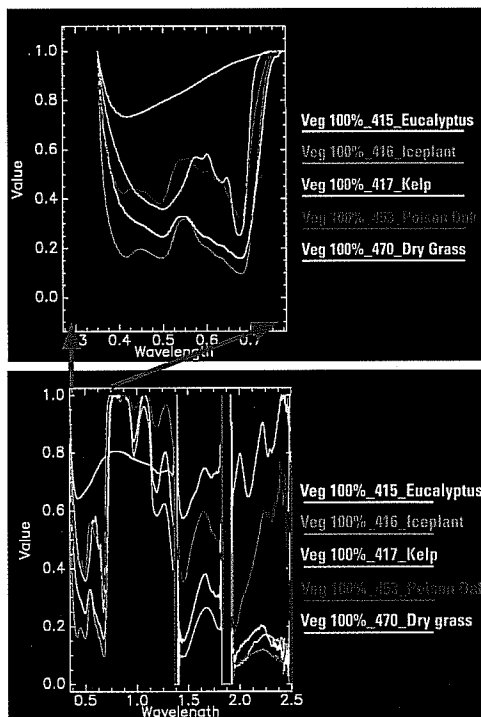
NASA's AVIRIS hyperspectral sensor (<http://aviris.jpl.nasa.gov>) collects 224 continuous bands of light that span from VNIR to

SWIR (~.4 to 2.5 micrometers [μm]). Each band averages ~.1 μm wide. Commercial hyperspectral sensors, such as Integrated Spectronics' HyMap (www.intspec.com) and Earth Search Sciences' Probe-1 (www.earthsearch.com), collect 124 bands of reflected VNIR-SWIR light, with each band averaging ~.15 μm wide.

In contrast to VNIR-SWIR hyperspectral sensors, most multispectral sensors collect four discontinuous (separated) bands of light that cover portions of blue to near-IR (.45 to .90 μm) wavelengths. Each multispectral band is relatively broad, averaging ~.70 μm wide. More and unique spectral information can be extracted from hyperspectral data than from multispectral data because of the fundamental difference in imaging technology.

Spectral Libraries

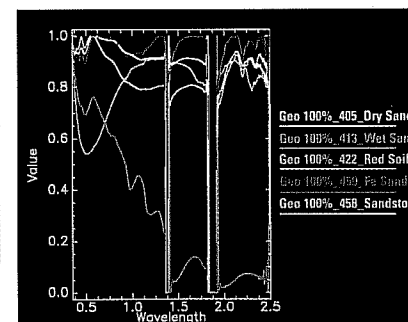
Because each hyperspectral pixel contains so much unique information, software has been developed that displays the spectral signature of surface materials within a pixel as a profile. A spectral profile shows the intensity of reflection and depth of absorption on the



Earth Search Sciences Probe-1 Imagery from The GeoSAT Com



Figure 1: Spectral profiles collected from pixels in an airborne hyperspectral datacube (top center) show unique differences with different vegetation types (left), rocks and soils (right). Other pixels in the datacube with similar composition can be efficiently and accurately classified based on these spectral libraries.



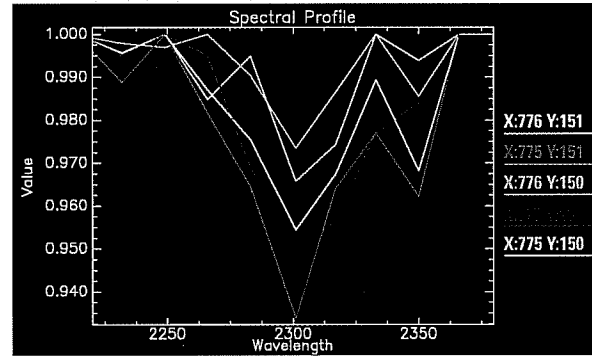
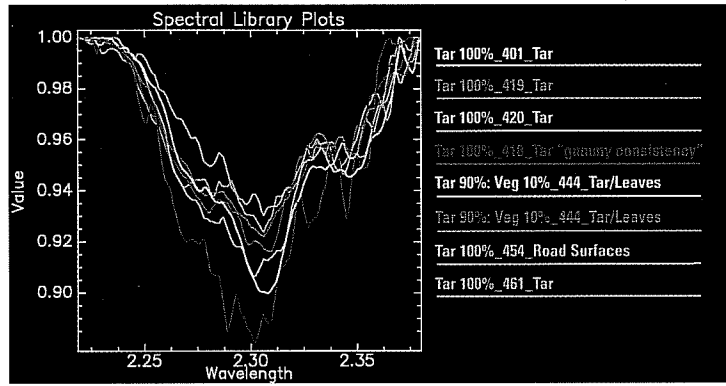
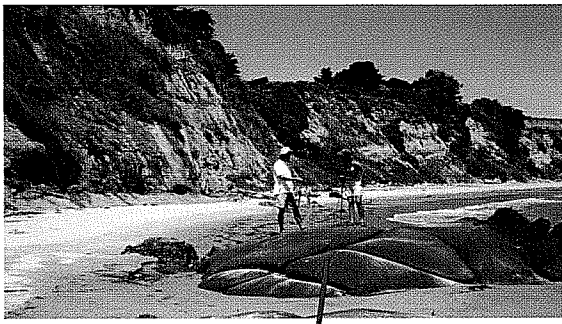
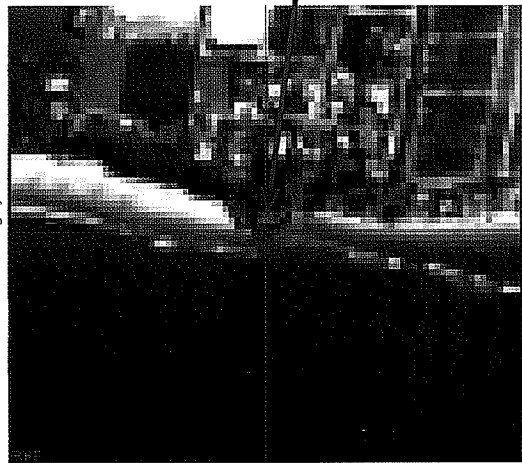


Figure 2: A ground photograph of an oil seep deposit (top left) verifies the deposit location on a hyperspectral datacube (bottom left). Subpixel and unmixing algorithms compensate for the larger pixels typically acquired by hyperspectral sensors. Spectral measurements of the bitumen absorption feature (2.2 to 2.4 μm) were collected on the ground with a portable spectrometer (top right). The ground measurements match spectral profiles acquired with an airborne sensor (bottom right), demonstrating that onshore oil spills, seeps and oil-stained sand can be detected from airborne platforms.



vertical axis, and the wavelength range on the horizontal axis. This enables visual correlation of spectral signatures with reference spectra and other pixels in the datacube. The higher the spectral curve, the more reflective the material is to that wavelength of light. The lower the spectral curve, the more absorptive the material is to that wavelength of light.

The depth, shape and wavelength location of absorption features in the spectral profile often can identify vegetation imaged within a short time frame, minerals, oil, disturbed soils and man-made materials.

To build a spectral library of different materials, one can collect spectral profiles from "pure" samples of each material in the field or laboratory. Several spectral libraries are available online or are loaded into image-processing software; however, site-specific libraries are more reliable for detailed mapping. Spectral libraries can be used to provide training sites or reference spectra to help derive maps of the surface material from airborne datacubes. As detailed in Figure 2, research has confirmed that airborne sensors collect spectral signatures that closely match those obtained in the field with portable spectroradiometers.

Overcoming Large Pixels

Most pixels contain a mixture of materials—a varying percentage of water, concrete, different plant communities, exposed soil, etc.

Hyperspectral data often are collected with larger pixels (3 to 10 meters) than other airborne sensors to maximize the area imaged and reduce acquisition costs. ENVI software contains sophisticated algorithms that compensate for the relatively large pixels. The software allows users to detect targets that cover only a small percentage of the pixel and can spectrally unmix unique surface materials within a pixel to determine their relative abundance. Images can be generated that highlight spectrally unique targets and an abundance of specific materials across an area of interest. These sub-pixel and unmixing algorithms effectively compensate for the relatively large airborne pixels.

Improving Pixel Location on a Map

Improving horizontal mapping accuracy has been one of the biggest challenges facing the airborne hyperspectral community. Maps derived from hyperspectral datacubes have been exceptional, but getting each pixel into its correct map location for integration with other data in a geographic information system (GIS) has been difficult because of sensor and airborne navigation challenges. Datacubes provided by NASA and most airborne hyperspectral imaging companies now have rectification solutions.

Diverse Applications

Hyperspectral sensors that collect 100+ continuous bands spanning the VNIR-SWIR wavelength range acquire a rich, deep datacube that can be effectively used for many applications.

A VNIR-SWIR datacube can be used to evaluate environmental, facility and geologic conditions. VNIR-SWIR hyperspectral sensors are most effective for mapping high-value assets (industrial complexes, brownfields, military installations, wetlands, parks, etc.) and detecting specific targets that have a unique spectral signature. The following sections examine a few of the many applications that benefit from hyperspectral data.

Mapping Geology

Hyperspectral technology is most effective for mapping minerals and rocks. Many minerals have unique and robust spectral absorption features that indicate their composition and identity. Extensive spectral libraries have been published that make hyperspectral mapping of minerals and rocks effective and efficient. The SWIR component is essential for detecting and mapping clays, calcite, anhydrite and other surface minerals.

Spectral characteristics of soils are a function of several properties, including clay mineral composition, texture, moisture, organic matter content, iron-oxide content and surface roughness. These variations in organic and inorganic constituents enable users to identify and accurately map surface soils, especially disturbed soils, with VNIR-SWIR hyperspectral sensors.

Oil Detection

VNIR-SWIR hyperspectral sensors can detect onshore oil spills and oil-stained ground

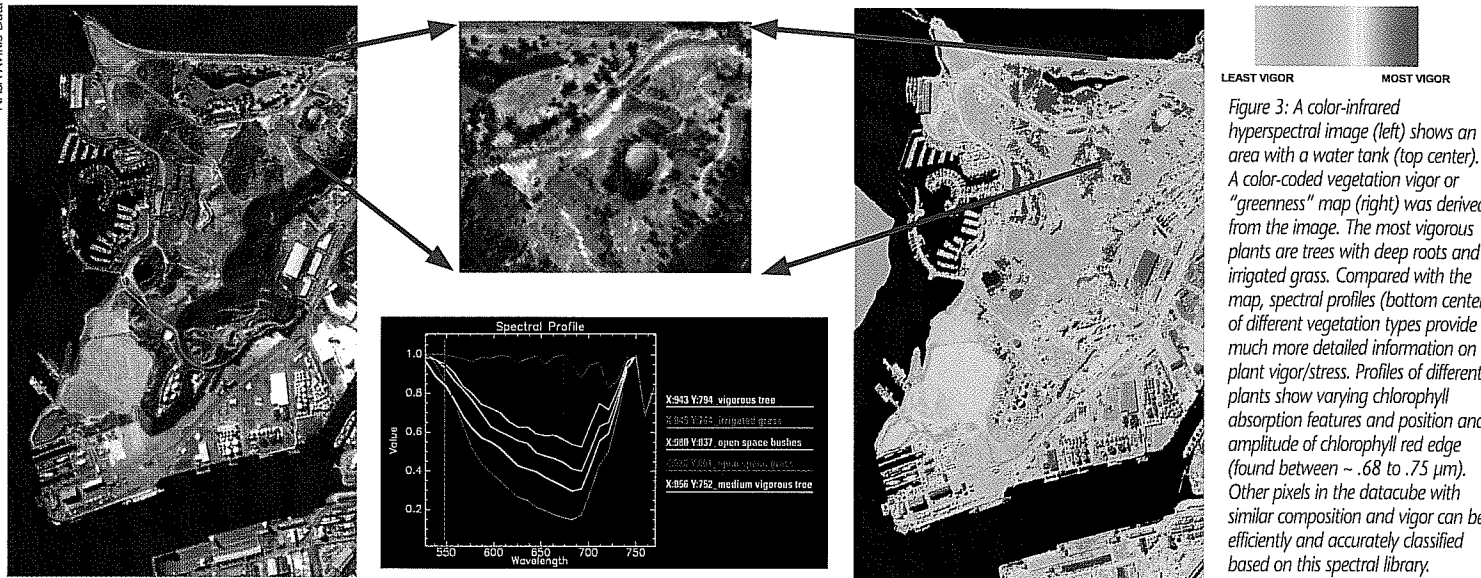


Figure 3: A color-infrared hyperspectral image (left) shows an area with a water tank (top center). A color-coded vegetation vigor or "greenness" map (right) was derived from the image. The most vigorous plants are trees with deep roots and irrigated grass. Compared with the map, spectral profiles (bottom center) of different vegetation types provide much more detailed information on plant vigor/stress. Profiles of different plants show varying chlorophyll absorption features and position and amplitude of chlorophyll red edge (found between ~.68 to .75 μm). Other pixels in the datacube with similar composition and vigor can be efficiently and accurately classified based on this spectral library.

because oil has unique spectral characteristics (Figure 2). Many analyses have used the bitumen absorption feature at $\sim 2.3 \mu\text{m}$ as the primary hydrocarbon indicator. Other research has analyzed different absorption features found across the near-IR to SWIR wavelength spectrum. In addition, oil seepage can alter soil surfaces by forming calcite, pyrite, sulfur, iron oxides and sulfides, as well as bleaching red beds, changing clay minerals and prompting chlorophyll red edge shift in affected vegetation. Hyperspectral remote sensing can detect all of these alterations. Oil detection and mapping can be an integral part of an environmental baseline for high-value assets such as oil fields, refineries, tank farms, pipelines and exploration acreage with the use of hyperspectral technology.

Mapping Vegetation

Plant communities and often plant species can be differentiated and mapped with hyperspectral sensors. Plants appear green to human eyes because blue and red light (.45 and .65 μm) are preferentially absorbed while green light

to classify the rest of the vegetated pixels in airborne datacubes. The extrapolation of vegetation spectral libraries to airborne datacubes requires all the data to be collected within a short time frame and under similar environmental conditions. To provide standardized maps of vegetation cover, many narrow-band indices have been developed, including crop chlorophyll content and normalized difference water index.

Vegetation Vigor/Stress

Hyperspectral imaging provides detailed information about vegetation stress across the VNIR-SWIR spectrum. As with multispectral data, informative color-infrared images can be generated using narrow wavelength near-IR, red and green bands. Near-IR and red bands can be used in an NDVI formula to generate a vegetation vigor/stress or "greenness" map (Figure 3).

However, in addition to these images, a visible to near-IR spectral profile of plants in each hyperspectral pixel reveals the shape and depth of the chlorophyll absorption feature.

More and unique spectral information can be extracted from hyperspectral data than from multispectral data because of the fundamental difference in imaging technology.

(.55 μm) is reflected—this can be seen clearly in spectral profiles of vegetation. Compared with multispectral and film imaging, hyperspectral data quantifies in detail the degree of absorption and reflection in the visible light spectrum by plant pigments in the leaves. Hyperspectral sensors record the high reflectance and transmittance of light with wavelengths of .7 to 1.2 μm —this is related to internal leaf structure and vigor. In addition, the SWIR sensor (~ 1.4 to 2.5 μm) collects diagnostic information related to plant moisture.

By collecting spectral profiles at pixels (training sites) with known vegetation types, a spectral library can be built that can be used

In addition, the position and amplitude of the chlorophyll red edge (found between $\sim .68$ to $.75 \mu\text{m}$) can be measured and standard indices developed to map stress or vigor across an area. With the SWIR capability, the level of moisture in plants also can be accurately monitored.

As plants become less vigorous, the depth of the chlorophyll absorption feature decreases and the position of the chlorophyll red edge can shift to shorter wavelengths. This is clearly shown in spectral profiles comparing vigorous to stressed plants. In addition, decreasing water content associated with increasing stress can be seen on spectral profiles across VNIR-SWIR wavelengths, but is most pronounced in the

SWIR region. To provide standardized maps of vegetation stress, many narrow-band indices have been published that specify specific wavelengths in the formulas.

Water Quality

To penetrate a clear column of water and map bathymetry, submerged plants and navigation hazards, the remote sensing instrument needs to be able to record reflected blue light ($\sim .4$ to $.5 \mu\text{m}$). Green and red light are scattered in the water column and don't penetrate as deeply as blue light. Longer wavelength near-IR and SWIR light is totally absorbed by clear water—no light is reflected back to the sensor. Clear water is characterized by a relatively flat and decreasing reflectance across the visible to near IR wavelengths.

In contrast, bodies of water that contain varying amounts of organic and inorganic material cause predictable changes in the spectral signatures recorded by hyperspectral sensors. These spectral changes can be correlated with water quality. With increasing concentration, clay- and silt-sized minerals suspended in the water column will systematically alter the spectral signatures within pixels. Microscopic plants and animals suspended in the water column also change water's spectral characteristics. The chlorophyll in microscopic plants (algae) absorbs blue and red light, reflects green light and strongly reflects near-IR light. The more chlorophyll in the water column, the more pronounced the spectral absorption and reflection patterns.

Ever-Expanding Use

Hyperspectral sensors and analyses are providing more information from remotely sensed imagery than ever. As new sensors provide more hyperspectral imagery and new image processing algorithms continue to be developed, hyperspectral imagery is positioned to become a common research, operational and monitoring technology in a variety of fields. EJ