LETTER 6: JOHN EATON, PRESIDENT. MOUNTAIN AREA PRESERVATION FOUNDATION.

ATTACHMENT A

SURVEY OF VOTERS AND PROPERTY OWNERS REGARDING OPEN SPACE, PARKS AND RECREATION

Survey of Voters and Property Owners Regarding Open Space, Parks and Recreation

Conducted for the

Town of Truckee

December 2004

True North Research

741 Garden View Court Suite 208
Encinitas, California 92024
Phone 760.632.9900 Fax 760.632.9993
www.tn-research.com

and

Shilts Consultants

2300 Boynton Avenue Suite 201
Fairfield, California 94533
Phone 800.273.5167 Fax 707.426.0109
www.shilts.com

TABLE OF CONTENTS

LIST OF TABLES

List of Figures

Introduction to Study

True North Research, Inc. (True North) and Shilts Consultants, Inc. (SCI) are pleased to present the results of the voter and property owner opinion study conducted for the Town of Truckee. The purpose of the study was to a) identify respondents' perceptions, needs, and priorities with respect to open space, parks and recreation, and b) evaluate support for the establishment of a revenue measure to fund the acquisition of open space lands, as well as the maintenance and improvement of parks and recreation areas.

To meet the latter objective, the study was designed to:

- Measure *baseline*[1] support for a revenue measure to fund the acquisition and preservation of open space, as well as the maintenance and improvement of parks and recreation areas,
- Identify the types of projects that voters and property owners are most interested in funding,
- Expose respondents to arguments both in favor of, and against, the proposed measure to gauge how information affects support for the measure, *and*
- Estimate respondents' support for a measure once they have been provided with more information about the proposed measure.

In addition to the key findings from the research, this report outlines the methodology employed in the study and presents SCI's and True North's recommendations regarding how the Town can best move forward based on the survey results.

Different measures, different methodologies One of the key objectives of this study was to determine how support for the proposed revenue measure may vary depending on the type of funding mechanism employed: sales tax or benefit assessment. The election environments, legal and logistical considerations, as well as the campaign opportunities are quite different for these two mechanisms. For example, in a sales tax election, all registered voters who are likely to participate in the election of interest represent the appropriate universe. In an assessment proceeding, however, only property owners are eligible to participate in the ballot proceeding, and apartment and commercial property owners are typically included as well as residential property owners. Individuals who own investment properties (e.g., vacation homes) in Truckee are also allowed to participate in a benefit assessment -- but not a sales tax election if they are not registered to vote in Truckee. Moreover, whereas in sales tax elections each vote is weighted equally in determining the outcome, in assessment ballot proceedings the higher the amount of a property owner's assessment, the greater the weight of their vote in determining the outcome of the election. Assessment ballot proceedings also employ different voting procedures, as all property owners are mailed a ballot.

Because the election and campaign environments for sales taxes and benefit assessments differ on so many dimensions that ultimately affect whether a measure will win or lose, it was important that the research methodology take these differences into account in order to ensure reliable results for each unique scenario. Although the methodologies used for the study are

1. Baseline support is the amount of support that exists in the community today, without the benefit of a public education campaign.

explained in greater detail later in this report (see "Methodology" on page 29), it is worth noting at the outset that this study involved two different surveys. The first survey, administered via telephone, was designed to gauge the opinions of voters who would likely participate in a sales tax election.[2] The second survey, administered via mail, was designed to gauge the opinions of property owners who would likely participate in a benefit assessment proceeding. The results of both surveys are presented in this report.

ORGANIZATION OF REPORT This report is designed to meet the needs of readers who prefer a summary of the findings as well as those who are interested in the details of the results. For those who seek an overview of the findings, the sections titled *Just the Facts* and *Conclusions* are for you. They provide a summary of the most important factual findings of the survey in bullet-point format and a discussion of their implications. For the interested reader, this section is followed by a more detailed question-by-question discussion of the results from the survey by topic area (see *Table of Contents*), as well as a description of the methodology employed for collecting and analyzing the data. And, for the truly ambitious reader, a set of crosstabulations for the survey results is contained in Appendix A.

DISCLAIMER The statements and conclusions contained in this report are those of the authors -- Dr. Timothy McLarney and Richard Sarles at True North Research, Inc. and Gerard van Steyn at SCI -- and are not necessarily those of the Town of Truckee. Any errors and omissions are the responsibility of the authors.

2. It was administered to voters who, based on their voting history, were expected to participate in the November 2004 general election.

JUST THE FACTS

The following is an outline of the main factual findings from the survey. For the reader's convenience, we have organized the findings according to the section titles used in the body of this report. Thus, if you would like to learn more about a particular finding, you can simply turn to the appropriate report section.

IMPORTANCE OF LOCAL ISSUES

- When asked to rate 7 issues facing their community in terms of their importance, voters who were administered the sales tax survey rated protecting water quality as the most important issue, followed by protecting the environment and preserving open space and nature lands.

FIRST BALLOT TEST - SALES TAX

- With only the information provided in the ballot language, 73% of voters initially indicated that they would definitely (47%) or probably (26%) vote in favor of the proposed measure to raise the local sales tax by one-quarter percent to fund the acquisition and protection of open space, as well as the maintenance and improvement of parks and recreation areas.

BALLOT TEST BENEFIT ASSESSMENT

- After being provided with an information piece that described the purpose and potential benefits of the measure, 67% of property owners indicated that they would vote in favor of a benefit assessment to fund the acquisition and protection of open space -- as well as the maintenance and improvement of parks and recreation areas -- at a base rate of $28 per SFE, per year.[3] The corresponding support levels for the measure using an annual base rate of $56 per SFE was 59%.

PROPOSED PROJECTS

- Of the 10 projects tested among those who participated in the sales tax survey, voters most favored protecting land around the Truckee River, lakes and streams to preserve water quality, followed closely by maintaining existing parks and open spaces, protecting sensitive wildlife habitats and wildlife corridors, creating and maintaining trails for hiking, biking, horse-back riding and cross-country skiing, and permanently protecting open space.
- Of the 11 projects tested among those who participated in the benefit assessment survey, property owners most favored protecting land around the Truckee River and lakes to preserve water quality, followed by maintaining and improving existing parks and open space areas, acquiring and permanently protecting open space land, and creating and maintaining trails for recreational activities including: hiking, biking, horse-back riding, and cross-country skiing.

POSITIVE ARGUMENTS

- When presented with arguments in favor of the measure, voters who participated in the sales tax survey found the following arguments to be the most persuasive: *"Clean water, clean air, and natural open space are what make Truckee a special place to live. This mea-*

3. SFE stands for single family equivalent, which is the fee amount received by the typical detached single family home.

sure will help protect these resources and our quality of life", followed by *"A sales tax will make sure that tourists and visitors to Truckee pay their fair share for the facilities and services they use while here"*, and *"This measure provides the resources needed to purchase and save open space areas that may otherwise be developed"*.

NEGATIVE ARGUMENTS

- When presented with arguments against the measure, voters who participated in the sales tax survey found the following arguments to be the most compelling: *"If it wants to, the Town can protect open space through zoning laws rather than through raising taxes"*, followed by *"Local government can't be trusted with this tax. They will mismanage the money or spend it on their own pet projects"*, and *"Voters just approved 15 billion dollars in State bonds due to the budget crisis - which we will be paying off for the next 15 years. This measure will add another 20 year tax on top of this debt"*.

SECOND BALLOT TEST - SALES TAX

- After learning more about the projects that could be funded by the measure, as well as hearing arguments both in favor of -- and against -- the proposed sales tax, approximately 72% of voters indicated that they would definitely (50%) or probably (22%) support the proposed open space, parks and recreation measure.

MEASURE OPTIONS

- Sixty-five percent (65%) of voters indicated that they would support the proposed quarter-cent sales tax if it were also paired with a motel bed tax.
- Among the 35% of respondents who were unwilling to support the sales tax if it were paired with a motel bed tax, approximately 14% were willing to support the proposed measure if it were set at a rate of one-eighth cent.

CONCLUSIONS

The following conclusions are based on True North's and SCI's interpretations of the survey results, as well as the firms' collective experience conducting dozens of studies for similar revenue measures throughout the State.

Should the Town of Truckee proceed with plans to fund the acquisition and protection of open space, as well as the maintenance and improvement of parks and recreation areas, through a revenue measure?

Yes. The vast majority of voters and property owners in the Town of Truckee consider the preservation of open space, the protection of water quality, and the maintenance of parks and recreation areas to be very important issues. Moreover, the survey results suggest that, if packaged properly and combined with a broad-based and well-funded public education effort, the measure has a very good chance of being successful.

Having recommended that the Town move forward, it is important to note that this recommendation to take the next steps toward presenting a revenue measure to the community comes with several qualifications and conditions. Indeed, although the results are quite promising, all revenue measures must overcome challenges prior to being successful. The proposed measure is no exception. The following paragraphs discuss some of the challenges and the next steps that True North and SCI recommend.

Which funding mechanism should the Town select for the revenue measure?

One of the key objectives of this study was to determine how support for the proposed revenue measure may vary depending on the type of funding mechanism employed: sales tax or benefit assessment. The study indicates that the latent level of support for the proposed measure is sufficient for passage of either a sales tax or a benefit assessment.

In deciding which route to choose, the Town should consider the many legal, logistical and electoral differences between a sales tax and a benefit assessment that will ultimately affect the measure's chances of success. For example, although latent support among registered voters for a sales tax is somewhat higher (73%) than is support for a benefit assessment among property owners (67%), the thresholds for passage needed under California law for the respective measures are also quite different. A sales tax requires support from a two-thirds supermajority of participating voters to be successful, whereas a benefit assessment requires support from a weighted majority of property owners. In this respect, the benefit assessment enjoys a substantially greater margin of latent support above that needed for passage when compared to a sales tax. Then again, a sales tax has the relative advantages of higher expected revenue growth, lower election costs, and less legal uncertainty. Should the Town be interested, True North and SCI will be happy to discuss in greater detail the pros and cons associated with each funding mechanism given the results of this study as well as the firms' collective experience working on similar measures throughout the State.

How will the tax rate affect support for the measure?

Naturally, the willingness of voters or property owners to support a specific revenue measure is contingent -- in part -- on the tax rate associated with a measure. The higher the rate, all other things being equal, the lower the level of aggregate support that can be expected. It is critical that the Town set the tax or fee at a level that the necessary proportion of voters or property owners view as affordable.

Based on the results of this study and keeping in mind the statistical margins of error associated with the surveys, True North and SCI recommend that the Town set the sales tax rate at one-quarter cent or less. The fee rate for a benefit assessment should not exceed an annual rate of $40 per SFE. Future tracking research is highly recommended as it will be useful for determining if adjustments to these amounts are possible or warranted.

How might a public information campaign affect support for the proposed measure?

As noted in the body of this report, voters' opinions about revenue measures are often not rigid, especially when the amount of information presented to the public on a measure has been limited. Thus, in addition to measuring current support for the measure, one of the goals of this survey was to explore how the introduction of additional information about the measure may affect voters' opinions about the measure.

It is clear from the survey results that voters' opinions about the proposed measure are somewhat sensitive to the nature -- and amount -- of information that they have about the measure. Information about the specific types of projects that could be funded by the measure, as well as arguments in favor of the proposed measure, were found by many voters to be compelling reasons to support the measure. Moreover, this information played an important role in maintaining the latent level of support for the measure once respondents were exposed to opposition arguments.

Accordingly, one of the keys to building and maintaining support for the proposed measure will be the presence of an organized and well-funded outreach campaign to that focuses on the need for the measure as well as the many benefits that it will bring.

How might an opposition campaign affect support for the measure?

Given the latent level of support for the proposed measure and the sensitivity of voters to opposition arguments, it is likely that an opposition campaign could significantly reduce aggregate support for the proposed measure -- perhaps below the level needed for passage. This is especially true for the sales tax option that requires a supermajority of two-thirds support. Thus, a second key to building public support for the measure is for the Town to conduct targeted outreach to those individuals and organizations that may be predisposed to campaign against the measure. The ability of the Town to bring these individuals and organiza-

tions onboard -- or at least convince them to sit quietly on the sidelines -- will strongly shape the measure's chance of success.

How might the economic or political climate alter support for the measure?

An important component of any ballot measure's potential for success is the economic and political climate surrounding the election. Although the recession has relaxed its grip on the State in some ways, the recovery has been a jobless one -- and it has done little to raise consumer confidence. Together with the state of the economy, lingering concerns about the aftermath of the war in Iraq and the State budget crisis combine to create an economic and political climate that is not as favorable to quality-of-life revenue measures it has been in prior years.

The results of this study and the conclusions noted above must be viewed in light of the current times. Should the economy and/or political climate change in ways that would be more favorable, support for the measure -- and the potential effectiveness of a positive education campaign -- could increase considerably. Conversely, negative economic and/or political developments could dampen support for a measure below what was recorded in this study.

Is there a need for future research?

The goal of the baseline research was to gather the information necessary to determine if a revenue measure is feasible and, if so, how it should be packaged to best meet the needs of the community. Accordingly, the baseline research did not test a *specific* measure package. Rather, it used somewhat generic ballot language and tested -- in an itemized fashion -- different projects, funding mechanisms, tax rates, and arguments in an attempt to identify which resonated with voters and which did not.

The baseline sales tax survey was also conducted among a limited sample (300) of voters who were likely to participate in the November 2004 election -- which was a very high turnout election. High turnout elections tend to favor quality of life revenue measures as they draw to the polls individuals who are part of the natural constituency for open space, parks and recreation measures but who tend to participate in primary, off-year and special elections at disproportionately low rates.[4] Consequently, the baseline sales tax survey results are reflective of the most favorable universe of voters -- one more favorable than the measure will encounter if it is placed on a ballot in 2005 or 2006 when turnout will be substantially lower.

For both of these reasons, True North and SCI strongly recommend that -- prior to making a formal decision about placing a sales tax measure on the ballot -- the Town conduct a limited tracking survey to gauge support

4. For example, renters are often the most supportive group of voters for open space, parks and recreation measures, but they participate far less often in primary, off-year and special elections.

for the measure *as a package* among those voters who are likely to participate in the election that the Town expects to place the measure on the ballot. The tracking research will help the Town refine the measure package, gauge the effectiveness of public education efforts, and determine whether there is sufficient support among the likely voter universe to warrant placing a measure on the ballot at that time.

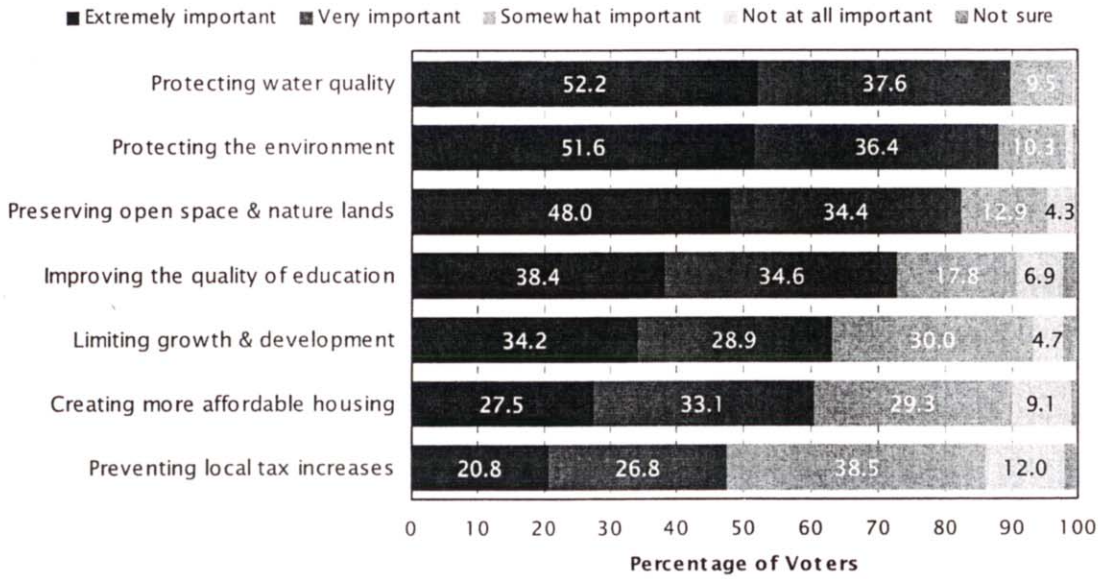
Local Issues

The first substantive question of the sales tax survey presented respondents with a series of issues and asked them to rate the importance of each issue. Because the same response scale was used for each issue, the results provide an insight into how important each issue is on a scale of importance *as well as* how each issue ranks in importance relative to the other issues tested.[5]

Figure 1 presents each issue tested, as well as the importance assigned to each issue by survey participants, in rank order of importance.[6] Overall, protecting water quality received the highest percentage of respondents indicating that the issue was either extremely important or very important (90%), followed by protecting the environment (88%), and preserving open space and nature lands (82%). Given the purpose of this study, it is instructive to note that preventing local tax increases was rated as the *least* important of all of the issues tested, with less than half (48%) of respondents indicating that this issue was either extremely or very important.

Question 1 -- Sales Tax Survey *To begin, I'm going to read a list of issues in your community. For each one, please tell me how important the issue is to you, using a scale of extremely important, very important, somewhat important or not at all important.*

Figure 1 Importance of Issues



5. To avoid a systematic position bias, the order in which the issues were read to respondents was randomized for each respondent.
6. Issues were ranked based on the percentage of respondents who indicated that the issue was either extremely important or very important.

First Ballot Test - Sales Tax

One of the primary research objectives of this study was to determine voters' support for a sales tax measure that would raise the local sales tax by one-quarter percent to fund the acquisition and protection of open space, as well as the maintenance and improvement of parks and recreation areas. To this end, Question 2 was designed to take an early assessment of voters' support for the proposed sales tax measure.

The motivation for placing Question 2 up-front in the survey is twofold. First, voter support for a measure can depend on the amount of information they have about a measure. At this point in the survey, the respondent has not been provided information about the proposed measure beyond what is presented in the ballot language. This situation is analogous to a voter going to the polls with limited knowledge about the measure, such as what might occur in the absence of an effective education campaign. Question 2 -- also known as the First Ballot Test -- is thus a good measure of voter support for the proposed measure *as it is today* in the absence of an information campaign. Because the First Ballot Test provides a gauge of 'uninformed' support for the measure, it also serves a second purpose in that it provides a useful baseline from which to judge the impact of various information items conveyed later in the survey on voter support for the sales tax measure.

Question 2 -- Sales Tax Survey *Later this year, voters in Truckee will get to vote on a number of State and local issues. Let me read you one of the local measures you may be asked to vote on. In order to acquire and preserve natural open space, protect lands around rivers, lakes and streams, and create and maintain public access trail systems, shall the Town of Truckee enact a one-quarter cent sales tax not to exceed 20 years in duration?*

If the election were held today, would you vote yes or no on this measure? Would that be definitely (yes/no) or probably (yes/no)?

FIGURE 2 FIRST BALLOT TEST -- QUARTER-CENT SALES TAX

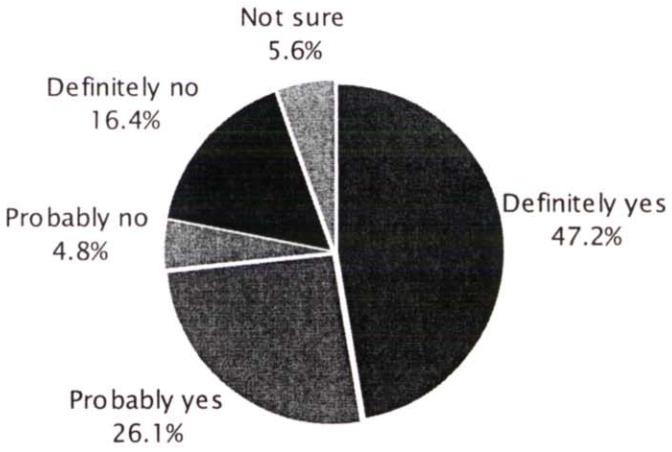


Figure 2 presents the results of the First Ballot Test among the 300 respondents administered the sales tax survey. Overall, 73% of respondents indicated that they would definitely or probably support the measure, whereas 21% stated that they would oppose the measure and 6% were unsure or unwilling to share their vote choice. For special taxes in California, this is 5% above the two-thirds (67%) threshold needed for the measure to pass.

SUPPORT BY SUBGROUPS For the interested reader, Table 1 shows how support for the sales tax measure at the First Ballot Test varied by key demographic traits such as length of residence, party affiliation and age. The Sample Size column indicates the number of respondents in each category. Because the statistical margins of error grow exponentially as the sample size decreases, the reader is cautioned against generalizing results for categories with fewer than 50 respondents. The cells highlighted in green correspond to the categories within each subgroup that displayed the highest level of initial support for the proposed measure.

TABLE 1 FIRST BALLOT TEST -- QUARTER-CENT SALES TAX: DEMOGRAPHIC BREAKDOWN OF SUPPORT

Demographic Subgroup		Sample Size	Probably or Definitely Yes	Not sure
Overall		300	73.3%	5.6%
Years in Truckee	Less than 2	25	71.0%	12.2%
	2 to less than 5	50	72.5%	6.0%
	5 to less than 10	64	72.0%	6.0%
	10 or more	155	74.0%	4.4%
Home Ownership	Own	253	72.7%	6.3%
	Rent	43	76.2%	2.3%
Party	Democrat	105	82.3%	5.3%
	Republican	98	61.0%	7.0%
	Other	23	73.7%	0.0%
	DTS	74	76.5%	5.9%
Gender	Male	154	71.2%	5.2%
	Female	146	75.4%	6.1%
Age	18 to 29	23	63.2%	13.0%
	30 to 39	62	77.2%	6.3%
	40 to 49	80	73.4%	1.4%
	50 to 64	97	74.6%	6.1%
	65 or older	38	69.2%	7.6%
Household Party	Single Dem	44	89.3%	2.1%
	Dual Dem	32	82.4%	0.0%
	Single Rep	42	60.5%	4.7%
	Dual Rep	39	57.5%	7.5%
	Other	84	78.6%	2.6%
	Mixed	60	68.5%	14.7%
Times Voted in Last Seven Elections	Less than twice	122	77.1%	6.6%
	Three to five	57	76.4%	3.5%
	Six or seven	121	67.9%	5.6%

BALLOT TEST BENEFIT ASSESSMENT

As noted in the *Introduction*, the benefit assessment survey employed a substantially different methodology than that used for the sales tax survey. In short, respondents were mailed a hard copy survey along with an information sheet that described the purpose and potential benefits of the measure -- much like what occurs in an actual assessment ballot proceeding. Thus, unlike the First Ballot Test described in the previous section for the sales tax survey, respondents who participated in the benefit assessment survey were provided with additional information about the measure prior to being asked their opinions about the measure.

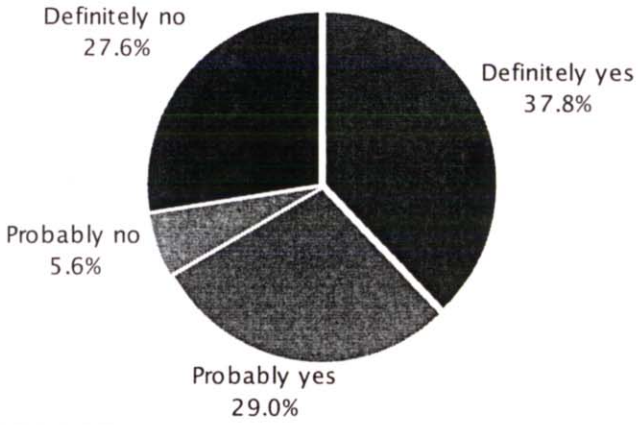
Although the substance of the ballot language used in the benefit assessment survey (see below) was identical to that tested in the sales tax survey, the actual fee amount was tailored to each property owner based on the number, size, and type of properties they own according to County records. Thus, for example, an individual who owns multiple properties received a higher fee than his/her counterpart that owns fewer properties, all other things being equal.

The survey also tested two base rates for calculating each property owner's fee -- $28 per year and $56 per year. Figure 3 presents the results of the Ballot Test among that portion of the 931 respondents whose fee was based on a $28 per year SFE[7] rate. Figure 4 presents the same results for respondents who received a fee based on a $56 per year SFE.[8]

Question 1 -- Benefit Assessment Survey *Property owners in your area may be asked to vote by mail on a local ballot measure. Following is a summary of the proposal:*

In order to acquire and preserve additional natural open space lands, protect lands around rivers, lakes, and streams, maintain and create trails, would you support an additional annual tax for your property(s) in the amount of _____[9]?

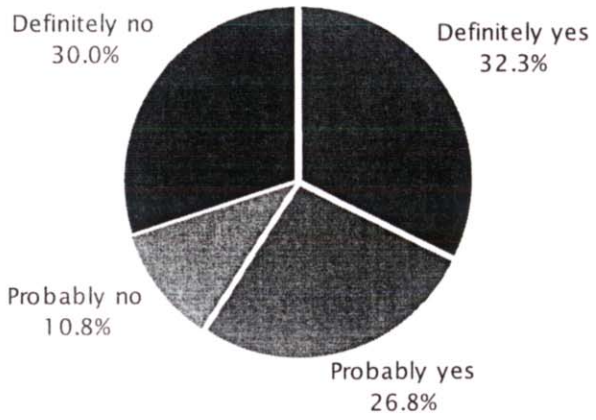
FIGURE 3 BALLOT TEST -- BENEFIT ASSESSMENT AT $28 ANNUAL RATE



7. SFE stands for single family equivalent, which is the fee amount received by the typical detached single family residence.
8. Because participation rates vary by property owner type and all returned ballots are weighted in an assessment proceeding by the amount of the fee, the results of the assessment survey have also been appropriately weighted to reflect expected differences in participation rates and fee amounts
9. The total amount presented to property owners corresponded to the amount for all properties they owned, given the proposed annual base rate ($28 or $56).

Overall, 67% of property owners indicated that they would definitely or probably support the measure when presented with a fee based on a $28 annual SFE, whereas 33% stated that they would oppose the measure (see Figure 3). As expected, support for the measure was significantly lower among those property owners who were presented with a fee based on the higher $56 annual SFE. As shown in Figure 4, 59% of property owners indicated that they would support the measure at this rate, whereas 41% were opposed.

FIGURE 4 BALLOT TEST -- BENEFIT ASSESSMENT AT $56 ANNUAL RATE



SUPPORT BY PROPERTY OWNER TYPE The results shown in Figures 3 and 4 reflect the opinions of all types of property owners that are allowed to participate in a benefit assessment. In addition to owners of single family residences, those who own commercial and industrial properties are allowed to participate, as are apartment owners and individuals who own investment properties and vacation homes in Truckee. Figure 5 presents the expected weighted vote held by each property owner group if the Town were to pursue a benefit assessment. The *Large Owners* category includes individuals who own a large number of properties such that their fee would be substantially higher than the typical property owner.

FIGURE 5 EXPECTED WEIGHTED VOTE FOR BENEFIT ASSESSMENT BY PROPERTY OWNERSHIP GROUP

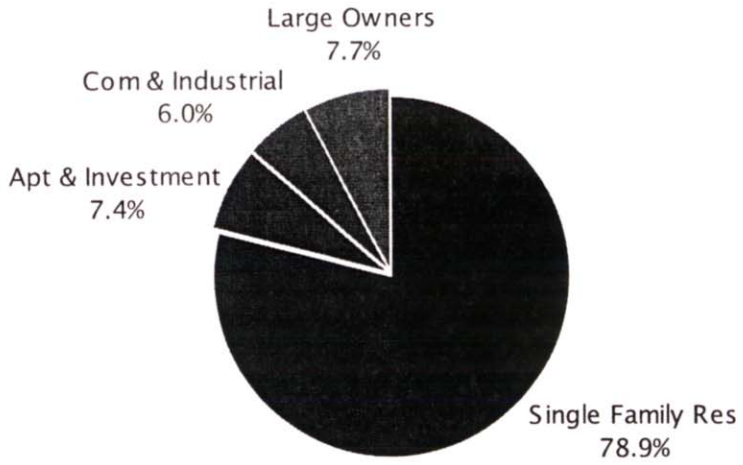
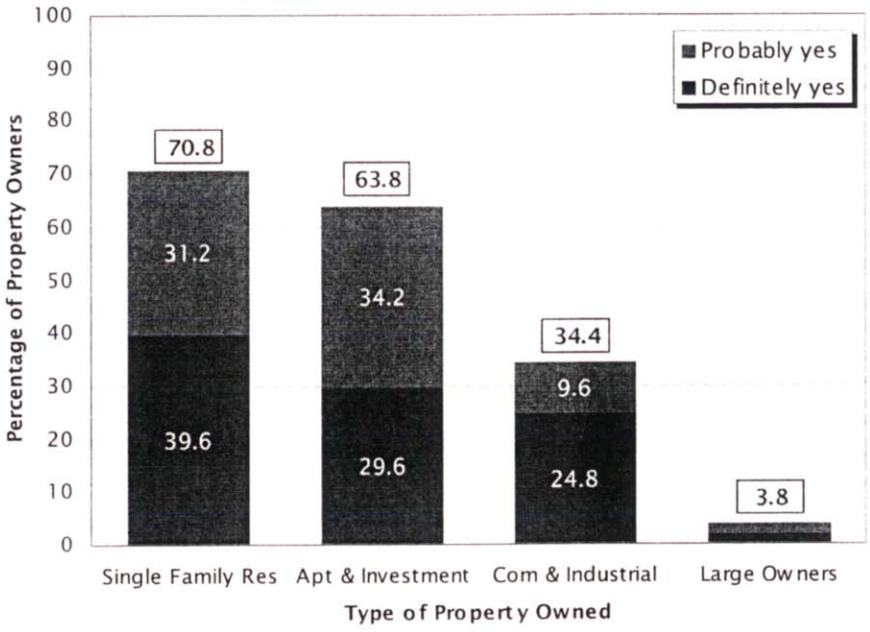


Figure 6 presents the Ballot Test results separately for each property owner group.[10] The patterns shown in the figure are consistent with what True North and SCI have found in other communities in California for open space, parks and recreation measures. Specifically, owners of single family residential properties who reside in the Town of Truckee are the most supportive of the proposed measure (71%), followed by the group that includes investment property owners and apartment owners (64%).[11] Support for the measure drops off dramatically among commercial and industrial property owners (34%) and individuals who own large amounts of property (4%).

FIGURE 6 BALLOT TEST -- SUPPORT FOR BENEFIT ASSESSMENT BY PROPERTY OWNERSHIP



10.The results are pooled for both the $28 and $56 rates.

11.Although they are grouped together in this figure, investment owners tend to be more supportive than apartment owners.

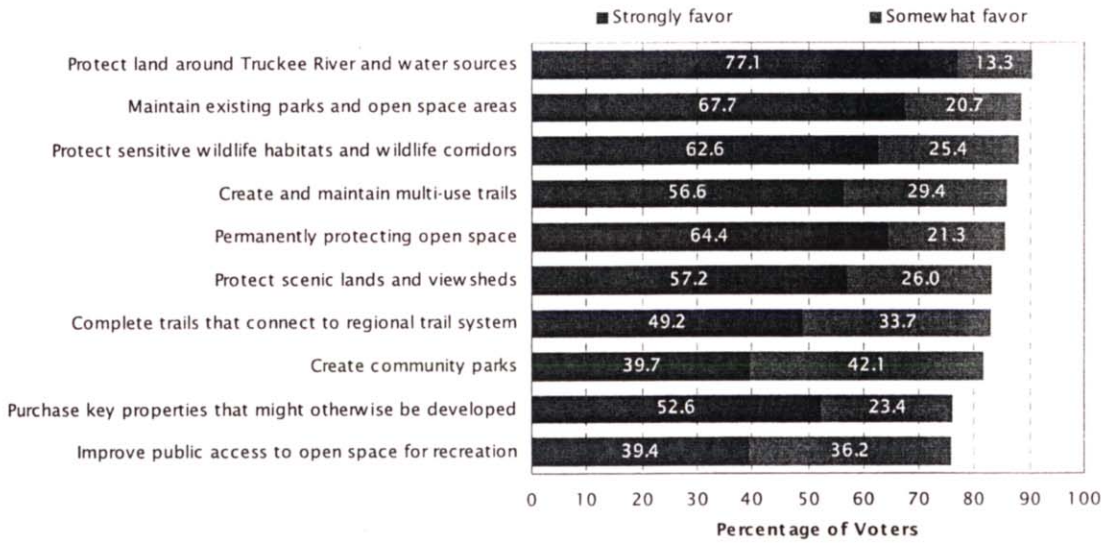
PROPOSED PROJECTS

The ballot language presented in Question 2 for the sales tax survey indicated that the proposed measure would be used to acquire and preserve natural open space, protect lands around rivers, lakes and streams, and create and maintain public access trail systems. The purpose of Question 3 was to provide more specific examples of the types of projects that may be funded by the proposed measure, as well as identify which projects voters most favored funding should the measure pass.

After reading each project, respondents in the sales tax survey were asked if they favor or oppose using some of the money to fund the project *should the measure pass*. The projects tested, as well as the voters' responses, are shown in Figure 7. For convenience, the projects are ranked in order of most favored to least favored, and the figure displays just the percentage of respondents who indicated that they strongly favor (dark green) or somewhat favor (light green) funding the project.

Question 3 -- Sales Tax Survey *The ballot measure I just described could fund a variety of projects in Truckee. If the measure passes, would you favor or oppose using some of the money to: _____, or do you not have an opinion? Would that be strongly (favor/oppose) or somewhat (favor/oppose)?*

FIGURE 7 PROPOSED PROJECTS -- SALES TAX SURVEY



Among the projects tested, voters most favored protecting land around the Truckee River, lakes and streams to preserve water quality (90%), followed closely by maintaining existing parks and open spaces (88%), protecting sensitive wildlife habitats and wildlife corridors (88%), creating and maintaining trails for hiking, biking, horse-back riding and cross-country skiing (86%), and permanently protecting open space (86%). It is worth noting that all of the projects tested were favored by at least three out of four voters who participated in the sales tax survey.

For the interested reader, Table 2 displays the top five projects according to respondents' positions at the First Ballot Test for the sales tax survey. Although the percentage that favored spending money on a particular project varied depending on whether the group initially supported, opposed or was unsure of their position on the measure, the table reveals that all three groups ranked the same three projects within their list of top five: protect land around the Truckee River, lakes and streams to preserve water quality, maintain existing parks and open space areas, and protect sensitive wildlife habitat and wildlife corridors.

TABLE 2 TOP FIVE PROJECTS BY POSITION AT FIRST BALLOT TEST -- SALES TAX SURVEY

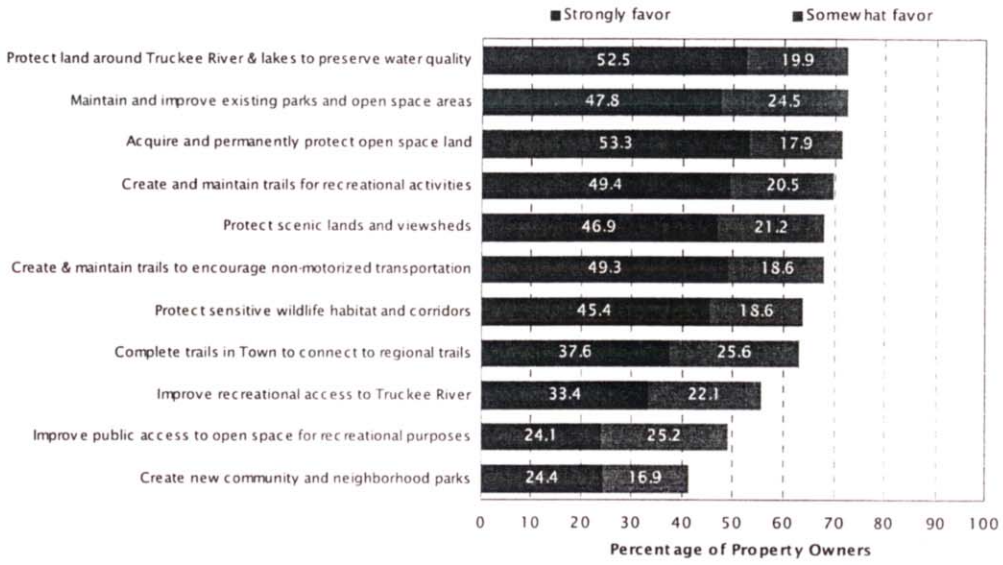
Position at First Ballot Test (Q2)	Top Five Projects -- Sales Tax Survey	% Strongly or Somewhat Favor
Probably or Definitely **Yes** (*n* = 220)	Protect land around Truckee River and water sources	96%
	Maintain existing parks and open space areas	94%
	Protect sensitive wildlife habitats and wildlife corridors	94%
	Permanently protecting open space	93%
	Protect scenic lands and viewsheds	92%
Probably or Definitely **No** (*n* = 63)	Maintain existing parks and open space areas	69%
	Protect land around Truckee River and water sources	69%
	Protect sensitive wildlife habitats and wildlife corridors	65%
	Create and maintain multi-use trails	64%
	Create community parks	63%
Not Sure (*n* = 17)	Protect land around Truckee River and water sources	100%
	Protect sensitive wildlife habitats and wildlife corridors	100%
	Permanently protecting open space	94%
	Create and maintain multi-use trails	89%
	Maintain existing parks and open space areas	88%

ASSESSMENT PROJECTS The assessment survey asked a similar series of questions regarding the projects that property owners would most favor funding *should the measure pass.* Because of the mail survey format, the question was asked in a slightly different manner in that a neutral position was allowed as a response to the question.

Because the universe for a benefit assessment is limited to property owners and includes not only commercial, industrial and apartment owners but also individuals who own property in an area but do not reside locally, support levels for quality-of-life measures and projects tend to be somewhat lower than those found among a traditional voter universe. This pattern holds true for the proposed measure -- although support levels are still quite strong (see Figure 8). Overall, property owners most favored using some of the money to protect land around the Truckee River and lakes to preserve water quality (72%), followed by maintain and improve existing parks and open space areas (72%), acquire and permanently protect open space land (71%), and create and maintain trails for recreational activities including: hiking, biking, horse-back riding, and cross-country skiing (70%).

Question 2 through 12 -- Benefit Assessment Survey *Assuming the measure is passed, the money generated by the assessment can be used for a variety of services within your area. If the measure is passed, would you favor or oppose using funds from the following services:*

FIGURE 8 PROPOSED PROJECTS -- BENEFIT ASSESSMENT SURVEY



POSITIVE ARGUMENTS

Ballot measures do not succeed or fail in a political vacuum. Proponents of a measure will present arguments to try to persuade voters to support a measure, just as opponents will present argument to achieve the opposite goal. The objective of Question 4 was thus to present respondents in the sales tax survey with arguments in favor of the measure and to identify whether they felt the arguments were convincing reasons to support the measure. Arguments in opposition to the measure were also presented and will be discussed in the next section. It is important to note that the order in which respondents received the arguments was randomized so that half of the sample received the positive arguments first, whereas the remaining half received the negative arguments first. Within each series, specific arguments were also administered in random order so as to avoid a systematic position bias.

Question 4 -- Sales Tax Survey *Supporters of the measure say: _____. Do you think this is a very convincing, somewhat convincing, or not at all convincing reason to SUPPORT the measure?*

FIGURE 9 POSITIVE ARGUMENTS -- SALES TAX SURVEY

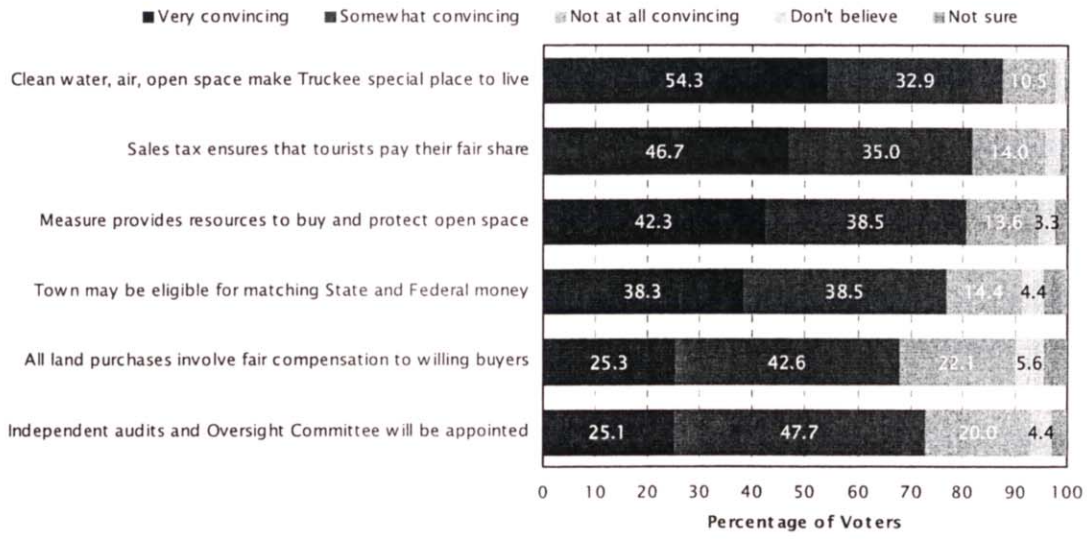


Figure 9 presents the positive arguments tested, as well as voters' reactions to the arguments. The arguments are ranked from most convincing to least convincing based upon the percentage of respondents who indicated that the argument was a *very* convincing reason to support the measure. Overall, the most compelling positive argument was *"Clean water, clean air, and natural open space are what make Truckee a special place to live. This measure will help protect these resources and our quality of life"* (54%), followed by *"A sales tax will make sure that tourists and visitors to Truckee pay their fair share for the facilities and services they use while here"* (47%), and *"This measure provides the resources needed to purchase and save open space areas that may otherwise be developed"* (42%). It is worth noting, moreover, that more than 60% of voters rated each of the positive arguments tested as at least a *somewhat* convincing reason to support the measure.

For the interested reader, Table 3 lists the top five most convincing positive arguments according to respondents' vote choice at the First Ballot Test.[12] The most obvious pattern in the table is also one that occurs regularly in revenue measure research and election campaigns: the positive arguments resonated with a much higher percentage of voters who were initially inclined to support the measure or were unsure when compared to voters who initially opposed the measure. Nevertheless, the argument ranked as the most convincing by all three groups was the same: "*Clean water, clean air, and natural open space are what make Truckee a special place to live. This measure will help protect these resources and our quality of life*".

TABLE 3 TOP FIVE POSITIVE ARGUMENTS BY POSITION AT FIRST BALLOT TEST -- SALES TAX SURVEY

Position at First Ballot Test (Q2)	Top Five Positive Arguments	% Very or Somewhat Convincing
Probably or Definitely **Yes** (*n* = 220)	Clean water, air, and open space make Truckee a special place to live	95%
	Measure provides resources to buy and protect open space	91%
	Sales tax ensures that tourists pay their fair share	91%
	Town may be eligible for matching State and Federal money	86%
	Independent audits and Oversight Committee will be appointed	82%
Probably or Definitely **No** (*n* = 63)	Clean water, air, and open space make Truckee a special place to live	61%
	Sales tax ensures that tourists pay their fair share	51%
	Town may be eligible for matching State and Federal money	48%
	Measure provides resources to buy and protect open space	45%
	All land purchases involve fair compensation to willing buyers	42%
Not Sure (*n* = 17)	Clean water, air, and open space make Truckee a special place to live	88%
	All land purchases involve fair compensation to willing buyers	83%
	Sales tax ensures that tourists pay their fair share	78%
	Independent audits and Oversight Committee will be appointed	78%
	Measure provides resources to buy and protect open space	77%

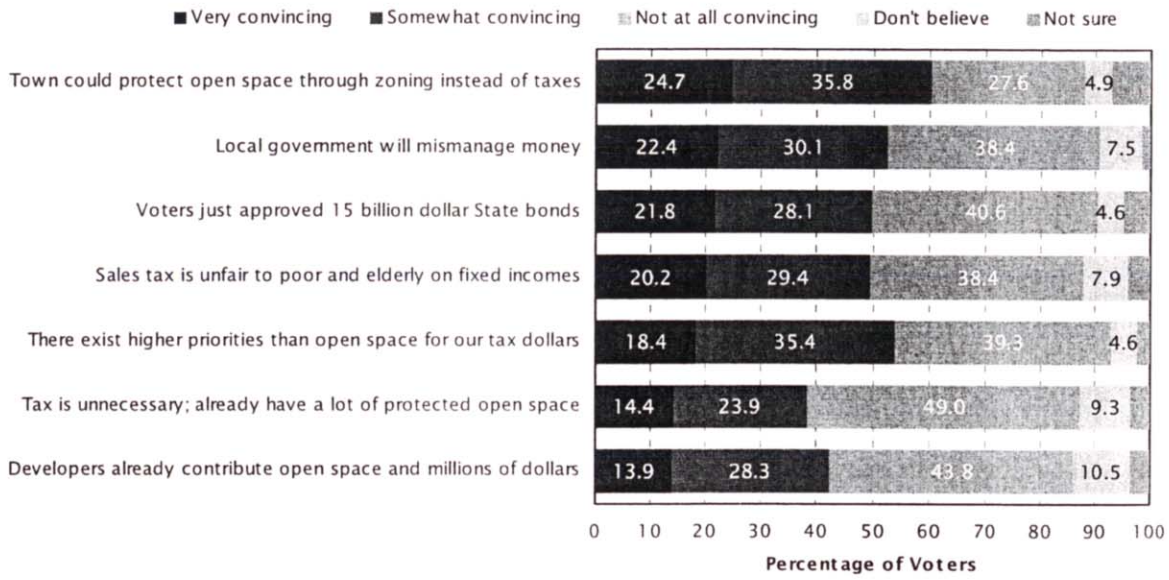
12.In this case, the arguments are ranked according to the combined percentage of respondents who indicated that the argument is either *very* convincing or *somewhat* convincing.

NEGATIVE ARGUMENTS

Whereas Question 4 presented respondents in the sales tax survey with arguments in favor of the measure, Question 5 presented respondents with arguments designed to elicit opposition to the measure. In the case of Question 5, however, respondents were asked whether they felt that the argument was a very convincing, somewhat convincing, or not at all convincing reasons to *oppose* the measure. The arguments tested, as well as voters' opinions about the arguments, are presented in Figure 10.

Question 5 -- Sales Tax Survey *Opponents of the measure say: _____. Do you think this is a very convincing, somewhat convincing, or not at all convincing reason to OPPOSE the measure?*

FIGURE 10 NEGATIVE ARGUMENTS -- SALES TAX SURVEY



The most obvious pattern when comparing the negative arguments to the positive arguments is that -- in general -- respondents were less receptive to the negative arguments. Nevertheless, approximately one-quarter of respondents indicated that *"If it wants to, the Town can protect open space through zoning laws rather than through raising taxes"* is a very convincing reason to oppose the measure. The next two most convincing reasons to oppose the measure were *"Local government can't be trusted with this tax. They will mismanage the money or spend it on their own pet projects"* (22%) and *"Voters just approved 15 billion dollars in State bonds due to the budget crisis - which we will be paying off for the next 15 years. This measure will add another 20 year tax on top of this debt"* (22%).

Similar to Table 3 in the prior section, Table 4 ranks the most compelling negative arguments according to respondents' vote choice at the First Ballot Test. Among those who took a position at the First Ballot Test -- either yes or no -- two arguments were the most convincing when ranked according to the percentage of respondents who felt the argument was either *very* or *somewhat* convincing: *"If it wants to, the Town can protect open space through zoning laws rather than through raising taxes"* and *"There are higher priorities for our tax dollars other than open space"*.

TABLE 4 TOP FIVE NEGATIVE ARGUMENTS BY POSITION AT FIRST BALLOT TEST -- SALES TAX SURVEY

Position at First Ballot Test (Q2)	Top Five Negative Arguments	% Very or Somewhat Convincing
Probably or Definitely **Yes** (*n* = 220)	Town could protect open space through zoning instead of taxes	53%
	There exist higher priorities than open space for our tax dollars	46%
	Local government will mismanage money	45%
	Voters just approved 15 billion dollar State bonds	43%
	Sales tax is unfair to poor and elderly on fixed incomes	43%
Probably or Definitely **No** (*n* = 63)	Town could protect open space through zoning instead of taxes	84%
	There exist higher priorities than open space for our tax dollars	79%
	Tax is unnecessary; already have a lot of protected open space	73%
	Local government will mismanage money	72%
	Sales tax is unfair to poor and elderly on fixed incomes	72%
Not Sure (*n* = 17)	Local government will mismanage money	82%
	Town could protect open space through zoning instead of taxes	66%
	Voters just approved 15 billion dollar State bonds	66%
	There exist higher priorities than open space for our tax dollars	63%
	Sales tax is unfair to poor and elderly on fixed incomes	59%

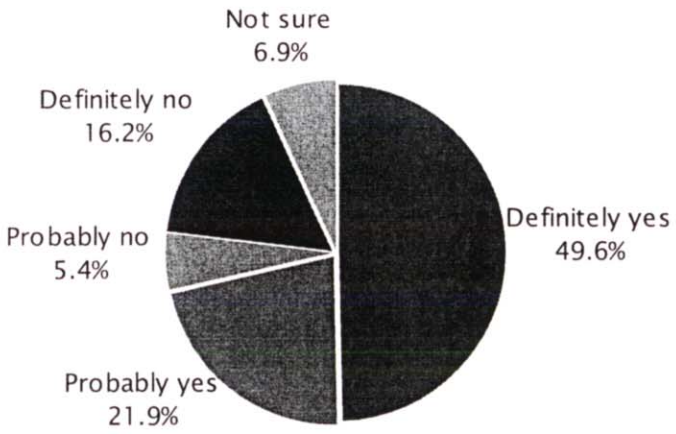
SECOND BALLOT TEST - SALES TAX

Voters' opinions about ballot measures are often not rigid, especially when the amount of information presented to the public on a measure has been limited. An important goal of the sales tax survey was thus to gauge how voters' opinions about the proposed measure may be affected by the information they could encounter during the course of a campaign. After providing respondents with the wording of the proposed measure, the projects and programs that could be funded by the measure, as well as arguments both in favor and against the proposal, respondents were once again asked whether they would vote 'yes' or 'no' on a measure to raise the sales tax by one-quarter percent to fund the acquisition and protection of open space, as well as the maintenance and improvement of parks and recreation areas.

Question 6 -- Sales Tax Survey *Sometimes people change their mind about a ballot measure once they have more information about it. Now that you have heard a bit more about the measure, let me read you a summary of it again. In order to acquire and preserve natural open space, protect lands around rivers, lakes and streams, and create and maintain public access trail systems, shall the Town of Truckee enact a one-quarter cent sales tax not to exceed 20 years in duration?*

If the election were held today, would you vote yes or no on this measure? Would that be definitely (yes/no) or probably (yes/no)?

FIGURE 11 SECOND BALLOT TEST -- QUARTER-CENT SALES TAX



At this point in the survey, overall support for the measure declined by 2% from the First Ballot Test to approximately 72% (see Figure 11). However, among supporters of the measure, the percentage who would *definitely* vote yes increased by about the same margin (approximately 2%). Overall support for the measure remained above the two-thirds threshold necessary for a sales tax of this type to pass under California law.

SUPPORT BY SUBGROUPS For the interested reader, Table 5 shows how support for the measure at the Second Ballot Test varied by key demographic traits. As noted previously in this report, the reader is cautioned against projecting the results for categories with fewer than 50 respondents.

The figure also shows net change in support by subgroups between the First and Second Ballot Tests (see far right column). Positive change is indicated with a '+' sign and green font, whereas negative change is indicted with a '-' sign and red font. In general, most groups exhibited declining support for the measure over the course of the survey, due in large part to the influence of the negative arguments.

TABLE 5 SECOND BALLOT TEST -- QUARTER-CENT SALES TAX: DEMOGRAPHIC BREAKDOWN OF SUPPORT

Demographic Subgroup		Sample Size	Probably or Definitely Yes	Not sure	Change in Support from Q2
Overall		300	71.5%	6.9%	-1.8%
Years in Truckee	Less than 2	25	75.5%	11.6%	+4.5%
	2 to less than 5	50	67.9%	10.2%	-4.6%
	5 to less than 10	64	72.0%	6.4%	+0.0%
	10 or more	155	71.9%	5.0%	-2.1%
Home Ownership	Own	253	71.8%	7.0%	-0.9%
	Rent	43	71.1%	5.1%	-5.1%
Party	Democrat	105	83.2%	7.1%	+0.9%
	Republican	98	57.0%	8.0%	-4.0%
	Other	23	68.4%	5.3%	-5.3%
	DTS	74	75.0%	5.9%	-1.5%
Gender	Male	154	71.5%	4.5%	+0.3%
	Female	146	71.4%	9.5%	-4.0%
Age	18 to 29	23	76.2%	-	+13.0%
	30 to 39	62	74.0%	6.0%	-3.2%
	40 to 49	80	64.8%	7.9%	-8.6%
	50 to 64	97	73.2%	9.2%	-1.4%
	65 or older	38	74.3%	5.0%	+5.1%
Household Party	Single Dem	44	87.2%	4.3%	-2.1%
	Dual Dem	32	85.3%	2.9%	+2.9%
	Single Rep	42	62.8%	2.3%	+2.3%
	Dual Rep	39	47.5%	12.5%	-10.0%
	Other	84	74.6%	5.3%	-4.0%
	Mixed	60	70.2%	12.9%	+1.7%
Times Voted in Last Seven Elections	Less than twice	122	72.9%	9.7%	-4.2%
	Three to five	57	69.6%	8.9%	-6.8%
	Six or seven	121	70.9%	3.2%	+3.0%

MEASURE OPTIONS

Following the Second Ballot Test, voters who participated in the sales tax survey were asked about several options that the Town is considering with respect to how best to fund open space protection. The first of these questions simply asked respondents if they would vote yes or no on the proposed quarter-center sales tax if the Town also enacted a motel bed tax so that tourists would pay for a larger percentage of the projects.

As shown in Figure 12, support for the proposed sales tax actually declined when it was paired with a motel bed tax.[13] Under these circumstances, just under two-thirds (65%) of respondents indicated that they would support the quarter-cent sales tax.

Question 7 -- Sales Tax Survey *Some people have suggested that if the Town passes a sales tax, it should also enact a motel bed tax so that tourists pay for a larger percentage of the open space projects. If the Town proposed a motel bed tax in addition to the sales tax, would you vote yes or no on the quarter-cent sales tax?*

FIGURE 12 SUPPORT FOR MOTEL BED TAX

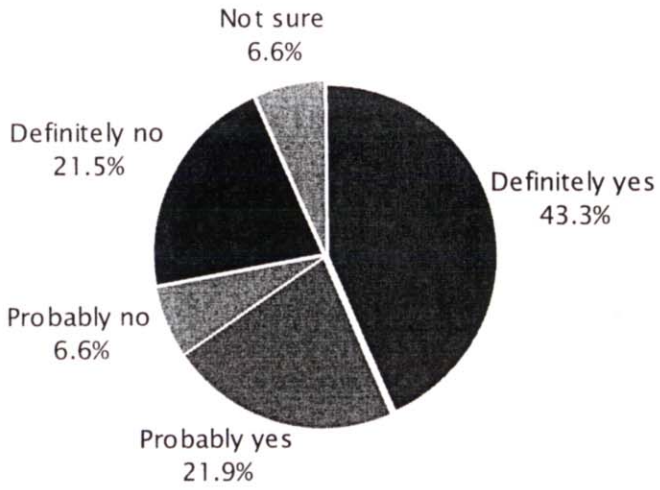


Figure 13 displays the individual-level changes that occurred between the Second Ballot Test (Question 6) and when the measure is paired with a motel bed tax (Question 7). On the left side of the figure is shown each of the response options to the Second Ballot Test and the percentage of respondents in each group. The cells in the body of the table depict movement within each response group (row) based on pairing the sales tax with a motel bed tax. For example, of the 49.6% of respondents who indicated that they would definitely support the measure at the Second Ballot Test, 35.2% also indicated that they would definitely support the measure if it were paired with a motel bed tax. Approximately 7% moved to the 'probably yes' group, 0.6% moved to the probably no group, 4.3% moved to the definitely no group, and 2.6% percent stated that they were now unsure of their vote choice.

13.Formally known as a transient occupancy tax (TOT).

To ease interpretation of the figure, the cells are color coded. Red highlighted cells indicate declining support, green indicate increasing support, whereas white cells indicate no movement. Moreover, within the cells, bold numbers indicate a fundamental change in the vote: from yes to no, no to yes, or not sure to either yes or no.

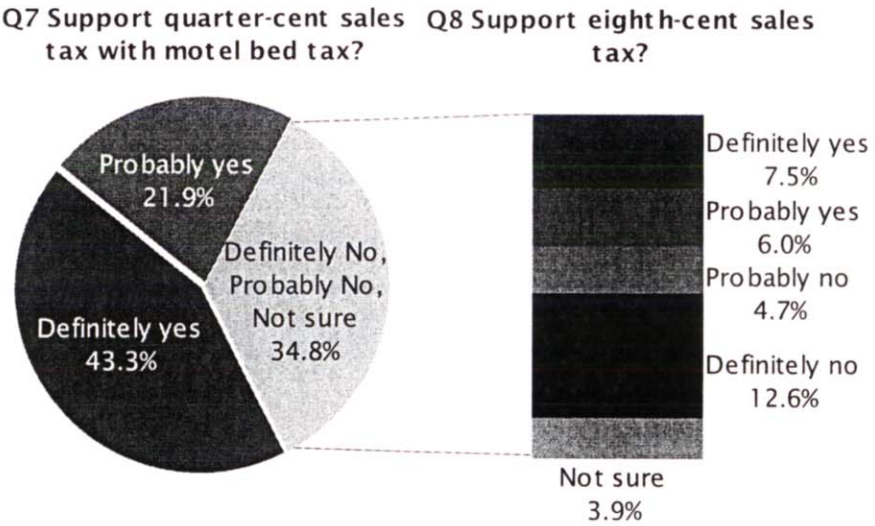
FIGURE 13 MOVEMENT BETWEEN SECOND BALLOT TEST AND SUPPORT FOR MOTEL BED TAX

Response to Second Ballot Test (Q6)		Response to Motel Bed Tax (Q7) Definitely yes	Probably yes	Probably no	Definitely no	Not sure
Definitely yes	49.6% →	35.2%	6.8%	0.6%	4.3%	2.6%
Probably yes	21.9% →	5.9%	9.7%	3.3%	1.6%	1.4%
Probably no	5.4% →	0.7%	1.0%	1.7%	1.7%	0.3%
Definitely no	16.2% →	1.2%	2.1%	1.6%	11.3%	0.7%
Not sure	6.9% →	0.3%	2.4%	0.0%	2.6%	1.6%

For the 35% of respondents who were unwilling to support the quarter-cent sales tax if it is paired with a motel bed tax (Question 7), the survey next asked if they would support the sales tax measure if it were set at a one-eighth cent rate rather than the proposed one-quarter cent rate. Figure 14 displays the answers to both questions. Among the 35% of respondents who were unwilling to support the sales tax if it were paired with a motel bed tax, approximately 14% were willing to support the proposed measure if it were set at a rate of one-eighth cent.

Question 8 -- Sales Tax Survey *If the rate for the sales tax measure we've been discussing were set at one-eighth cent rather than one-quarter cent, would you vote yes or no on the measure?*

FIGURE 14 SUPPORT FOR EIGHTH-CENT SALES TAX



DEMOGRAPHICS

In addition to questions that were directly related to the proposed sales tax measure, the survey also collected information about respondent demographics. The primary purpose of collecting this information was to allow the research team to analyze how opinions about the proposed sales tax may be shaped by demographic variables such as years living in Truckee, partisanship and gender. The tables in Appendix A, for example, use many of these background variables for crosstabulation purposes. Nevertheless, the information is also valuable for understanding the profile of those voters in Truckee. Accordingly, we present each of the variables and the aggregate results below.

FIGURE 15 YEARS IN TRUCKEE -- SALES TAX SURVEY

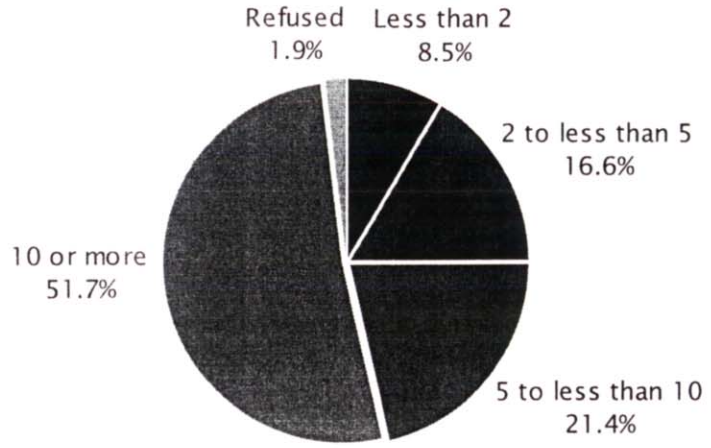


FIGURE 16 HOME OWNERSHIP -- SALES TAX SURVEY

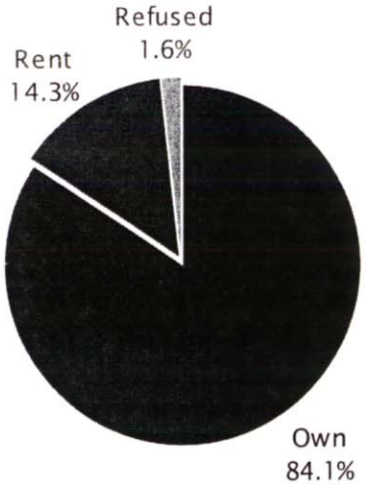


FIGURE 17 PARTY -- SALES TAX SURVEY

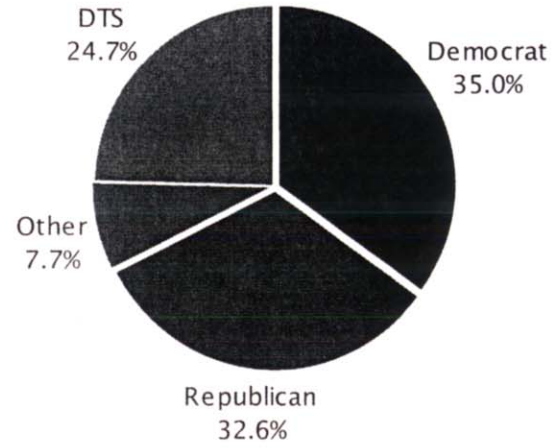


FIGURE 18 GENDER -- SALES TAX SURVEY

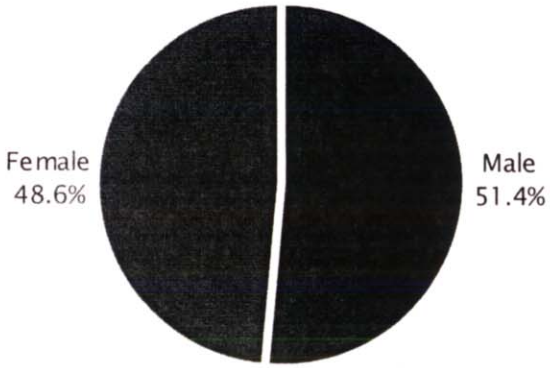


FIGURE 19 AGE -- SALES TAX SURVEY

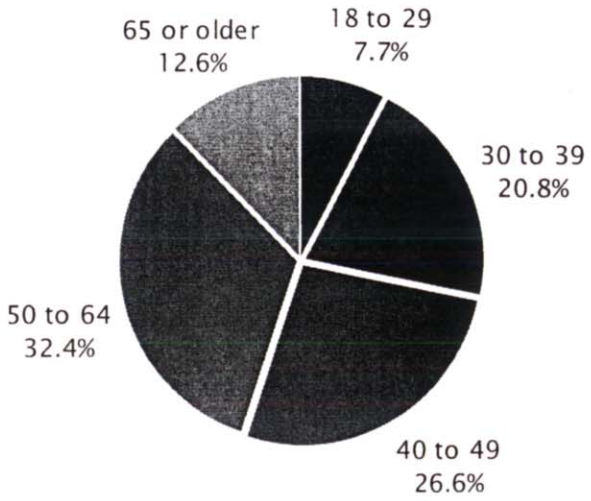
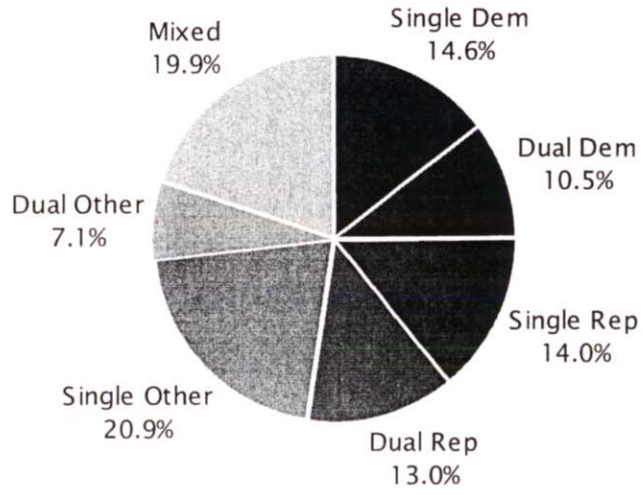


FIGURE 20 HOUSEHOLD PARTY -- SALES TAX SURVEY



METHODOLOGY

The following paragraphs provide an overview of the design and implementation of this study. Because the election and campaign environments for sales taxes and benefit assessments differ on so many dimensions that ultimately affect whether a measure will win or lose, it was important that the research methodology take these differences into account in order to ensure reliable results for each unique scenario. The particulars of each approach are highlighted in the appropriate headings below.

QUESTIONNAIRE DEVELOPMENT Dr. McLarney of True North Research worked closely with the Town of Truckee in developing the sales tax survey, whereas SCI crafted the mail questionnaire for the assessment survey. The ballot language and projects tested in the questionnaires were purposely kept similar to allow for a meaningful comparison of results across the two surveys. In both cases, the questionnaires were designed to avoid the many possible sources of systematic measurement error, including position-order effects, wording effects, response-category effects, scaling effects and priming. Several questions included multiple individual items. Because asking the items in a set order can lead to a systematic position bias in responses, the items were asked in a random order for each respondent in the sales tax survey.

Some of the questions asked in this study were presented only to a subset of respondents. For example, respondents in the sales tax survey who reported that they would support the proposed sales tax if it were paired with a motel bed tax (Question 7) were not asked the follow-up question (Question 8) which inquired if they would support the sales tax if the rate were reduced to one-eighth cent. Skip patterns were used to ensure that each respondent received the appropriate questions in the appropriate order.

DATA COLLECTION METHOD The sales tax survey was administered via telephone, which is the standard approach for conducting special tax revenue measure studies. Interviews were conducted via telephone during weekday evenings (5:30PM to 9PM) and on weekends (10AM to 5PM) between May 17 and May 26, 2004. It is standard practice not to call during the day on weekdays because most working adults are unavailable and thus calling during those hours would bias the sample. Interviews averaged 10 minutes in length.

Because a benefit assessment is administered via mailed ballots, the benefit assessment survey employed a similar data collection method. The surveys were mailed to property owners on October 19, 2004 and were tallied on December 2, 2004.

SAMPLES The sample for the sales tax survey was administered to registered voters in the Town of Truckee who are eligible to participate in a sales tax election. The sample was stratified and clustered by key voter characteristics -- i.e., age, gender, partisanship -- prior to randomly selected individual voters into the sample. A total of 300 voters were administered the sales tax survey.

For the benefit assessment survey, it was important that the sample accurately represented the opinions of Truckee property owners who are allowed, and expected, to participate in an assessment. The sample was developed by utilizing property ownership and voter file information and then stratified and clustered across property owners using strategic oversampling for specific

subgroups. In total, 3,236 surveys were mailed and 931 were returned at a response rate of 29%, which is similar to response rates for an actual assessment proceeding.

STATISTICAL MARGIN OF ERROR Because this study consisted of two random samples drawn from the voter and property owner universes in the Town of Truckee, the results can be used to estimate the opinions of all voters and property owners in the Town, respectively. Because not all voters participated in the study, however, the results have what is known as a statistical margin of error due to sampling. The margin of error refers to the difference between what was found -- for example -- in the survey of 300 voters for a particular question and what would have been found if all 7,897 voters identified in the Town had been surveyed for the study.

Continuing with the above example, in estimating the percentage of voters who would support the proposed sales tax measure at the First Ballot Test, the margin of error can be calculated if one knows the size of the population, the size of the sample, a confidence level, and the distribution of responses to the question. The appropriate equation for estimating the margin of error, in this case, is shown below,

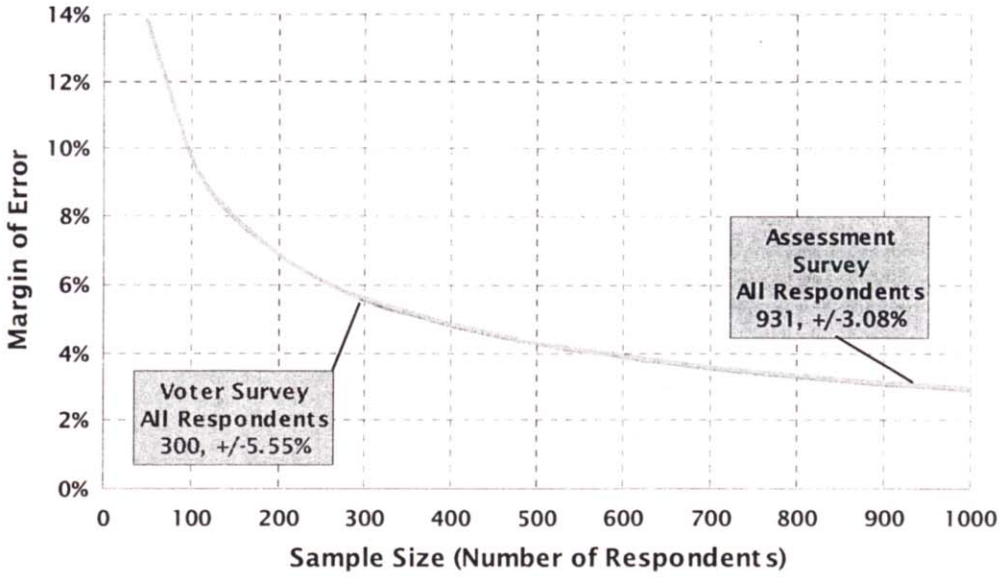
$$\hat{p} \pm t\sqrt{\left(\frac{N-n}{N}\right)\frac{\hat{p}(1-\hat{p})}{n-1}}$$

where $\hat{p}$ is the proportion of voters who said they would 'definitely' or 'probably' vote yes on the measure at the First Ballot Test (0.733 for 73.3%, in this example), N is the population size of the registered electorate (7897), n is the sample size for *this* question (300), and t is the upper $\alpha/2$ point for the t-distribution with $n-1$ degrees of freedom (1.96 at a 95% confidence interval).

Solving this equation using these values reveals a margin of error of +/- 4.92%. This means that if Question 1 found that 73.3% of respondents said they would vote yes on the proposed sales tax, one can be 95% confident that the actual percentage of all voters in the Town who would have voted yes is between 68% and 78%.

Figure 21 presents the margin of error equation as a graph, plotting sample sizes along the bottom axis. There are two lines represented on the graph which largely overlap -- one for the voter survey and one for the assessment survey. As seen in the figure, the maximum margin of error in this study for questions answered by all 300 voters is 5.55%, whereas the maximum margin of error for questions answered by all 931 property owners is +/-3.08%. For questions answered by fewer respondents, the margin of error increases accordingly.

FIGURE 21 MAXIMUM MARGIN OF ERROR



DATA PROCESSING & WEIGHTING Data processing consisted of entering the data, checking the data for errors and inconsistencies, and preparing frequency analyses and crosstabulations. For the assessment survey results, the data were also weighted prior to producing the results shown in this report so as to reflect the expected weighted vote in an assessment proceeding.

ROUNDING Numbers that end in 0.5 or higher are rounded up to the nearest whole number, whereas numbers that end in 0.4 or lower are rounded down to the nearest whole number. These same rounding rules are also applied, when needed, to arrive at numbers that include a decimal place in constructing figures and charts. Occasionally, these rounding rules lead to small discrepancies in the first decimal place when comparing tables and pie charts for a given question. This is because statistical software requires pie charts to sum to exactly 100%.

ATTACHMENT B

ANALYSIS OF GENERAL PLAN – 2020
SAN DIEGO COUNTY

Analysis of
General Plan-2020
San Diego County

Prepared for

Endangered Habitats League
8424-A Santa Monica Blvd., #592
Los Angeles, CA 90069

Prepared by

Conservation Biology Institute
651 Cornish Drive
Encinitas, CA 92024

CONSERVATION BIOLOGY INSTITUTE

December 2005

The Conservation Biology Institute provides scientific expertise to support conservation and recovery of biological diversity in its natural state through applied research, education, planning, and community service.

TABLE OF CONTENTS

List of Figures

List of Tables

1. INTRODUCTION

San Diego County is experiencing rapid growth that is spreading from urban centers to the historically rural and undeveloped portions of the county. These development patterns are controlled to a large degree by land use and residential development density zoning embodied in the County's General Plan. The changing land use in the county, and associated loss and fragmentation of natural habitats, has profound implications for the long-term viability of natural resources in the region.

County of San Diego staff are currently evaluating two land use alternatives as part of the update of the County General Plan (GP-2020), which we term the Staff alternative and the Board alternative (Figures 1 and 2). These alternative maps have significant differences in their zoning patterns which, in turn, will have significantly different levels of adverse effects to natural resources. The purpose of this report is to:

1. Review the scientific literature on the biological effects of land use changes associated with development.
2. Evaluate empirical evidence of habitat loss and fragmentation associated with differing densities of development that currently exist in San Diego County.
3. Compare the two GP-2020 alternatives with respect to their residential development density zoning and implications for specific vegetation communities in San Diego County.
4. Evaluate the significance of the impacts of the Staff and Board alternatives on vegetation communities and associated sensitive species in the county, focusing on areas of rare vegetation communities where the densities of the two alternatives differ in their zoning patterns.

2. LITERATURE REVIEW

Changing land use patterns in natural areas can have profound effects on the species they support. These effects include habitat loss and fragmentation, loss of native species, increases in nonnative and human-tolerant species, and altered physical processes (e.g., hydrologic regimes and fire cycles) that reduce habitat quality. Many of these effects are indirect impacts of development projects (e.g., increasing light and noise, facilitating invasions of nonnative species, increasing wildlife-human encounters, fire suppression), which can greatly exceed the magnitude of direct impacts on natural resources. Therefore, even though habitats may not be directly impacted by development, habitat values can be lost from indirect impacts of adjacent development and associated human uses and recreational activities.

Habitat fragmentation—breaking up contiguous natural habitats into small patches that are isolated from intact areas of habitat—and habitat loss are considered the single greatest threat to biodiversity at global and regional scales (Myers 1997, Noss and Csuti 1997, Brooks et al. 2002). Over 80% of imperiled or federally listed species in the U.S. are at risk from habitat degradation

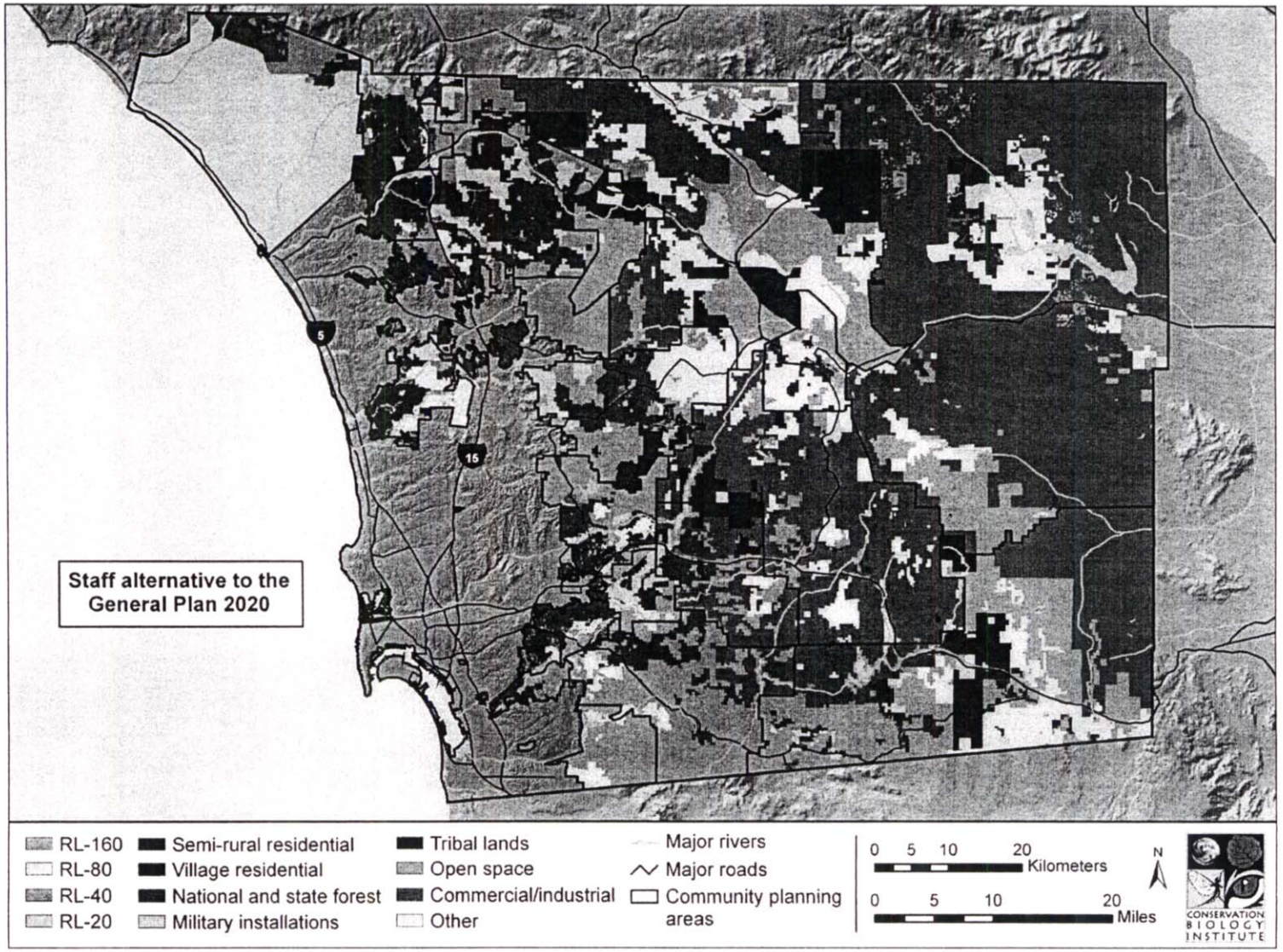


Figure 1. County of San Diego General Plan-2020 Staff alternative.

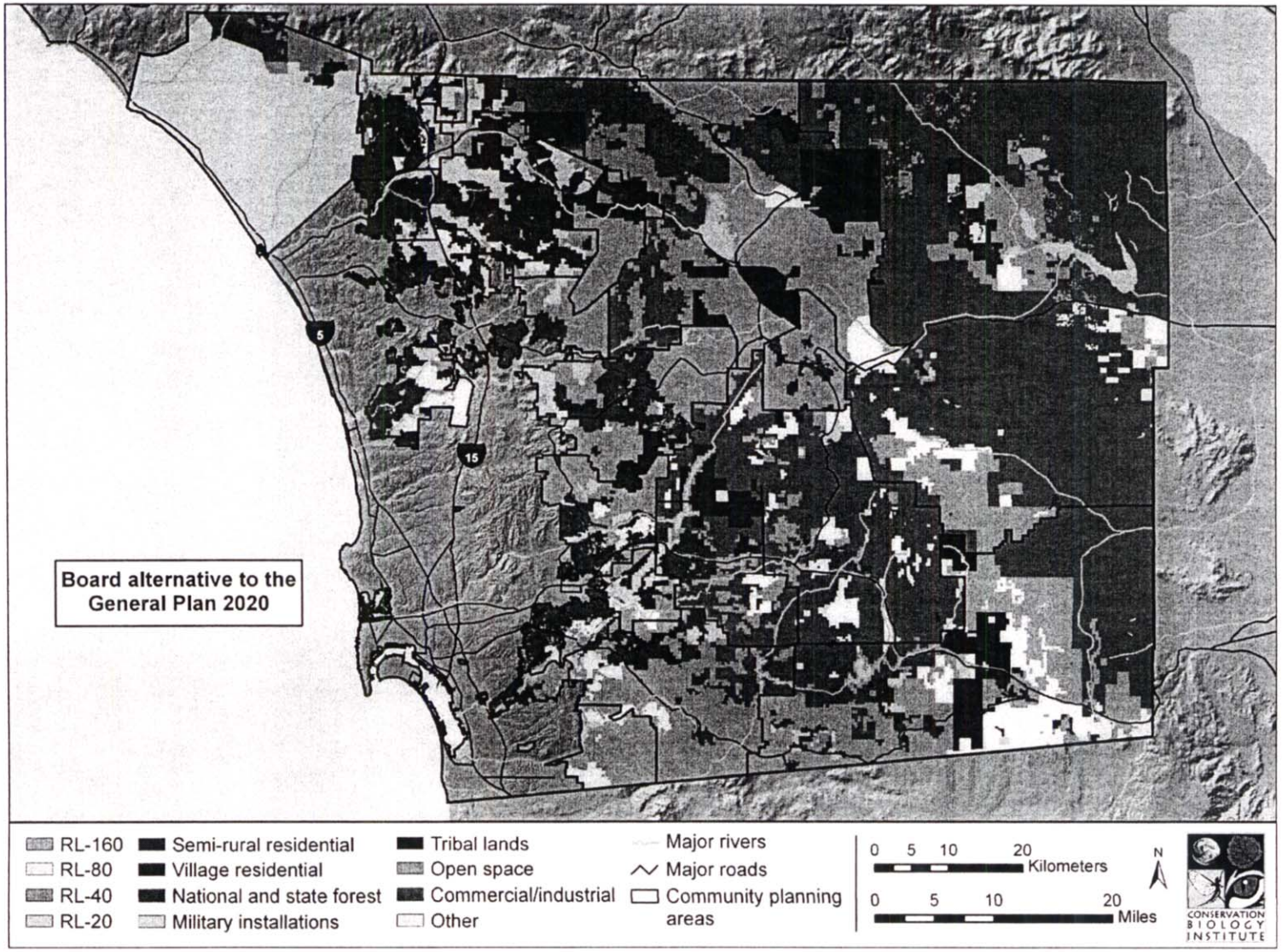


Figure 2. County of San Diego General Plan-2020 Board alternative.

and loss (Wilcove et al. 2000), and approximately 32% of California's diverse flora and vertebrate fauna are at risk (Stein et al. 2000). Urban sprawl, defined as encroachment of low-density, automobile-dependent development into natural areas outside of cities and towns, imperils 65% of species listed as Threatened or Endangered in California (Czech et al. 2001).

Habitat fragmentation also produces a habitat *edge*, where natural habitat conditions transition to a human-altered condition. This transition in habitat condition produces what are referred to as *edge effects* (Murcia 1995). Edge effects decrease the net, biologically functional area of habitats left undeveloped within landscapes fragmented by development. Edge effects take on many forms, including physical or structural changes (e.g., moisture levels, vegetation density), plant growth rates, and species interactions (e.g., predation, competition, brood parasitism, herbivory, pollination, and seed dispersal) (Murcia 1995, Sauvajot et al. 1998). As the precise nature of edge effects is variable and species- or habitat-specific, the extent of habitat impacts is also variable, usually disappearing within 50 m (160 ft) from the edge (Murcia 1995).. However, Wilcove et al. (1986) demonstrated effects that extended as far as 1,600 ft from the development-habitat edge.

Development and other human land uses generally facilitate the invasion of nonnative plant species into adjacent natural habitats, especially in small habitat fragments (McConnaughay and Bazzaz 1987, Tyser and Worley 1992, Brothers and Spingarn 1992, Matlack 1993). Invasive nonnative species in landscaping can become established and spread into the interior of natural open space areas. Construction of roads and other infrastructure (e.g., pipelines and transmission lines) and recreational activities within open space disturb existing vegetation, compact soils, and change natural runoff patterns. These alterations facilitate the invasion of nonnative plants, particularly annual grasses and forbs, by providing points of establishment within the interior of open space areas, where nonnative species can successfully outcompete native species in the altered physical environment. Clearing native vegetation to reduce fire threat and planting non-native ornamental plants around dwelling units also facilitates establishment of nonnative plant species in habitat areas adjacent to development.

Changes in land cover associated with development can modify physical processes that are integral to ecosystem function and thus can alter the dynamics of adjacent, undisturbed ecosystems (Pickett et al. 2001, Saunders et al. 1991). Poff et al. (1997) discuss the concept of the *natural flow regime* of riverine systems as the critical determinant of their biological composition. Because urbanization can modify the natural flow regime of stream systems, aquatic and riparian communities that depend on a natural flow regime are ultimately affected. Urbanization increases the area of impervious surfaces (Paul and Meyer 2001), which increases storm runoff, peak discharges, and flood magnitudes downstream (Dunne and Leopold 1978, Gordon et al. 1992, Leopold 1994). White and Greer (2006) found that increasing watershed urbanization and the use of landscaping irrigation produced increasing dry-season stream flow, which altered the historic composition of the riparian vegetation community associated with the stream. Impervious surfaces can also decrease the infiltration of precipitation into the soil, thus reducing groundwater recharge of streams and their dry-season baseflow (Klein 1979). Urbanization results in increased nutrient and sediment loads, elevated water temperatures, nonnative species invasions, and, ultimately, reduced abundance of native aquatic and riparian

species (Paul and Meyer 2001). Impervious surface cover associated with development can be used as a predictor of degradation of aquatic systems; a threshold of 10% of a watershed basin with impervious surface cover is indicative of degraded systems, and the level of degradation increases with increasing amounts of surface cover (Klein 1979, Booth and Jackson 1994).

Urbanization also alters natural fire cycles, as fuel loads are modified and fires are suppressed to protect human lives and property. Increasing human presence in Southern California has been associated with an increased frequency of wildlife ignition from anthropogenic sources (Keeley and Fotheringham 2001). Even very low density development can greatly change the fire regime of an area, and thus the dynamics of this ecological process, by altering fire frequency and fire suppression/protection requirements, such as fuel modification of native habitats and extinguishing fires that could otherwise be allowed to burn naturally. Fire protection activities can change the natural fire regime of areas in the vicinity of development, such that they may no longer sustain natural ecological systems and processes. Therefore, the many species that depend on natural physical processes to maintain suitable habitat can be locally extirpated as an area is developed.

While some species are tolerant of or respond positively to human modifications associated with development (i.e., *synanthropic* species), many native species are not (Soulé et al. 1988, Soulé et al. 1992, Bolger et al. 1991, Blair 1996, Crooks 2002). For example, in a study of forest birds in the northwest, synanthropic bird species, such as the house sparrow, American crow, European starling, and rock dove, and nonnative vegetation tended to increase in abundance in the vicinity of urbanization, whereas native forest species decreased in these areas (Donnelly and Marzluff 2004). Habitat fragmentation from development in Southern California has resulted in the loss of top carnivores from small habitat fragments, thereby allowing smaller *mesopredators* (e.g., opossums, skunks, etc.) to increase in number. This has the cascading effect of increasing predation rates on other species in the community (Soulé et al. 1988, Crooks 2002). Nest predation rates have been shown to be higher closer to habitat edges in other studies as well (Wilcove 1985, Andrén and Angelstam 1988), presumably from a greater abundance of synanthropic predator species. Harrison (1997) documented changes in gray fox diets and home range characteristics between rural residential and undeveloped areas, with foxes in residential areas consuming a higher frequency of mammal prey and anthropogenic food items than in undeveloped areas. Even human use of recreational trails in reserve areas has been associated with changes in bird species composition and a reduced frequency of nesting in the vicinity of trails (Miller et al. 1998).

The alterations of ecosystems by urbanization have been well documented by ecologists (see review by Pickett et al. 2001) and, like their responses to natural gradients (e.g., climate or productivity gradients), ecosystems also predictably respond to urban-rural gradients (McDonnell and Pickett 1990). Landscape-scale ecosystem studies along an 87-mile urban-rural transect in an eastern oak forest demonstrated significant reductions in forest patch size and increases in urban edge (Medley et al. 1995), as well as altered ecosystem processes resulting in modified physical and chemical environments (McDonnell et al. 1997), as one moved toward the urban end of the transect. Medley et al (1995) also note that the forest habitats in the suburban region of this transect are much more susceptible to fragmentation and recommend that

conservation and management actions should be directed at minimizing fragmentation and maintaining sustainable landscape structures.

Numerous studies have documented decreases in the numbers of native wildlife species and increases in the numbers of nonnative species tolerant of human-modified habitats along development intensity gradients extending from natural open space to urban areas. In the Sonoran Desert outside of Tucson, Arizona, Germaine et al. (1998) found that housing density best explained changes in bird species richness. In this study, nonnative bird species richness was positively related to housing density, while the richness of a group of sensitive bird species was negatively correlated with housing density. This pattern is largely a result of the greater abundance of nonnative plants and anthropogenic food sources in urban settings, which allow nonnative bird species to effectively outcompete native specialist bird species. Consistent with this pattern, Donnelly and Marzluff (2004) found that in western Washington, species richness of native forest bird communities was always higher in areas of exurban development than in suburban or urban areas, whereas the richness of synanthropic species was higher in suburban and urban areas.

In the oak woodlands of the Palo Alto area, both butterfly and bird communities exhibited responses to land use changes along an urban-wildland gradient (Blair and Launer 1997, Blair 1999). This gradient included a highly developed business district and office park, residential neighborhoods, a golf course, open space used for recreational activities (jogging, dog-walking, hiking, and equestrians), and a biological preserve with access for research and docent-led groups only. Along this gradient, both butterfly and bird species found in the biological preserve (the native oak woodland community) dropped out of the community in sites with increasing urbanization and human activity, including the open space recreational area, suggesting that any development or increased human use of an area is detrimental to the integrity of the original species assemblage (Blair and Launer 1997). They also found that golf courses, which are frequently classified as *open space*, do not function as well as natural open space areas for maintaining native species richness of bird and butterfly communities (Blair 1996, Blair and Launer 1997, Blair 1999). Comparable results were found in oak woodlands in the foothills of the Sierra Nevada (Placer County), where the abundance of native oak woodland species declined and the abundance of synanthropic species (e.g., house finch, western scrub jay) increased with increasing development density (Stralberg and Williams 2002). Native species richness and density in riparian habitats has also been shown to decrease adjacent to development and bridges, whereas the abundance of nonnative species increases (Rottenborn 1999).

A few studies have compared responses of wildlife species associated with specific development densities, thus allowing inferences regarding the threshold of development density at which adverse effects can be observed. For example, significant changes in lizard species composition in the Sonoran Desert outside of Tucson, Arizona were found at housing densities above 1 dwelling unit (DU)/2 acres (Germain and Wakeling 2001). In forested areas of Canada, Friesen et al. (1995) demonstrated average bird species diversity and abundance were lower in forest patches with housing densities ranging from 1DU/47 acres to 1DU/141 acres than in forest

patches of comparable size with no houses present. In this study, bird species diversity and abundance fell rapidly when housing density increased above 1DU/47 acres.

In a mosaic of shrub-steppe and prairie in Colorado, Maestas et al. (2001) assessed plant, bird, and mammalian carnivore community changes along a gradient of land use intensity from exurban development (1 DU/35-49 acres), to private ranch land, to protected public open space. They found that the greatest number of nonnative plant species occurred in areas of exurban development and the fewest on private ranches. Human-tolerant bird species (i.e., black-billed magpie, European starling, Brewer's blackbird, American goldfinch, house wren, broad-tailed hummingbird, and Bullock's oriole) were significantly denser in areas of exurban development than on either private ranches or public open space, whereas no statistical difference was found in their densities on private ranches or public open space. Several human-intolerant species (i.e., vesper sparrow, dusky flycatcher, savannah sparrow, and lark bunting) either were never seen or were statistically less abundant in areas of exurban development. Domestic dogs and cats were detected significantly more frequently and coyotes less frequently in exurban areas.

In a study of exurban development in a shrub oak-sagebrush community in western Colorado, Odell and Knight (2001) looked both at how bird and mammal species assemblages responded to two different densities of development relative to undeveloped land and their responses relative to distance from individual houses. In this study, Odell and Knight classified exurban development density in their sample plots as high (average of 1 DU/2.4 acres ± 1 DU/3.7 acres) or low (1 DU/26 acres ± 1 DU/30 acres). They found that the density of human-tolerant bird species (i.e., American robin, black-billed magpie, brown-headed cowbird, European starling, house wren, and mountain bluebird) were higher in developed areas than in undeveloped areas, and the density of human-intolerant species (i.e., black-capped chickadee, blue-gray gnatcatcher, black-headed grosbeak, dusky flycatcher, green-tailed towhee, orange-crowned warbler, plumbaceous vireo, and Virginia's warbler) was lower in developed areas than in undeveloped areas. Interestingly, the densities of both human-tolerant and intolerant species were generally not significantly different between the high and low density development areas, but low density areas were almost always significantly different than the undeveloped areas. Odell and Knight also found that the frequency of detection of mammal species followed a similar pattern, with domestic dogs and cats detected more frequently in developed areas and coyotes and foxes detected much more frequently in undeveloped areas, even when compared to the plots in low development density areas. Thus, even at very low exurban development densities, significant reductions of human-intolerant species and significant increases in human-tolerant species densities have been documented.

When looking at species responses to distance from individual houses, Odell and Knight (2001) found that the density of human-tolerant bird species was always higher and the density of human-intolerant bird species was lower at 30 m (96 ft) from a house than at either 180 m (576 ft) or 330 m (1,056 ft) from a house. This relationship also held for the detection frequency of mammal species, with detections of domestic dogs and cats decreasing with distance from houses (neither was detected at 330 m from houses) and detections of coyotes and foxes increasing with distance from houses. Therefore, in this study there appears to be a threshold of

effect of houses on the density of birds and detection frequency of mammals at a distance between 96 and 576 ft.

In summary, a great deal of research conducted within many different ecosystems documents a very clear negative effect of urbanization intensity on biological communities. Urbanization changes many physical and biological characteristics of adjacent natural areas, either via direct impacts or, perhaps more importantly, via indirect impacts. Indirect impacts to wildlife communities are often expressed as an increase in human-tolerant species at the expense of human-intolerant species. Edge effects have been documented to extend at least 100-160 ft into a patch from the edge, but can penetrate substantially greater distances in specific situations. Thus, accurate impact calculations for development projects must consider indirect impacts beyond the footprint of the development or individual houses themselves. In addition to documenting adverse effects of urban areas, this research also demonstrates significant biological effects of low density suburban or exurban development. Even development densities as low as 1 DU/40-50 acres have been documented to result in reduced abundances of human-sensitive species and increases in human-tolerant species. It is unclear whether significant effects may occur at densities below this threshold, as we found no published studies that explicitly compared effects to development densities above and below this threshold.

3. EMPIRICAL EVIDENCE FOR FRAGMENTATION-DEVELOPMENT DENSITY RELATIONSHIP

The scientific literature reviewed for this analysis documents a relationship between increasing DU density and adverse biological effects, and these effects are evident at densities as low as 1 DU/40-50 acres. In addition to changing vegetation composition and structure and providing more human-subsidized food sources, increasing DU density also results in the physical fragmentation of the landscape, not only from construction of houses and roads, but also from associated disturbances around DUs, such as clearing vegetation for fuel reduction, construction of stables and outbuildings, and recreational activities. We are particularly interested in the effects of very low density residential development (i.e., <1 DU/20 acres) on fragmentation. To examine the relationship between disturbance and fragmentation of natural vegetation and development density, we conducted an empirical analysis of habitat fragmentation on privately owned land in the unincorporated portion of San Diego County.

Methods

We conducted a fragmentation analysis by creating a grid of 160-acre cells for overlay on all privately owned land in the unincorporated county. We randomly selected 90 cells for analysis. Using year-2000 aerial photographs, we digitized areas of undisturbed natural vegetation and human disturbance (DUs, outbuildings, paved and dirt roads, cleared areas, crops) within each 160-acre cell and totaled the number of DUs for each cell. We excluded 30 grids that had extensive areas of crops (e.g., orchards) from our sample to focus the analysis on development from single-family residential development.

Using the computer program FRAGSTATS (McGarigal and Marks 1995), a commonly used tool in landscape ecology, we calculated a series of fragmentation metrics for each of the grid cells in our sample. FRAGSTATS computes 60 different fragmentation metrics that quantify various area, patch, edge, shape, core area, nearest neighbor, diversity, and contagion statistics. To illustrate the effects of development density on fragmentation, we selected four of these metrics as examples:

- Percent natural habitat—percent of each grid cell with undisturbed habitat.
- Mean patch size—average size of patches in each cell.
- Percent in core area—percent of each grid cell with habitat lying within a core area. Core areas are defined as the interior portion of patches after subtracting a 30 m (96 ft) buffer.
- Mean core area per patch—average size of core area patches (with core area defined as above) in each cell.

Formulas for calculating these metrics can be found in McGarigal and Marks (1995).

Based on the number of existing houses in each cell, we grouped cells into 7 density classes:

- 1DU/4 acre (6 cells)
- 1 DU/10 acre (12 cells)
- 1 DU/20 acre (9 cells)
- 1 DU/40 acre (9 cells)
- 1 DU/80 acre (9 cells)
- 1 DU/160 acre (9 cells)
- undeveloped areas (6 cells)

We used the replicate grid cell results for each density class to calculate a mean and 95% confidence interval (CI) for each fragmentation metric. The true mean of each population (i.e., each development density class) is found within the CI 95% of the time, given number of samples and their variation. The CI for a sample is calculated as:

$$95\% \text{ Confidence Interval (CI)} = t_{0.05,\,df}\,(\text{S.E.})$$

Where $t_{0.05,\,df}$ = Student's t critical statistic for Type I error rate = 0.05, and degrees of freedom (df) = n-1, S.E. = standard error of the mean, and n = sample size.

Results

The results of this analysis are presented graphically in Figure 3, with each of the four fragmentation metrics as a function of DU density class in four separate panels. For each metric, we plotted the mean fragmentation statistic ± 95% CI for each development density. The results show that there is a logarithmic relationship between fragmentation metrics and development density. The regression equation for each of the metrics is significant at $P < 0.02$.

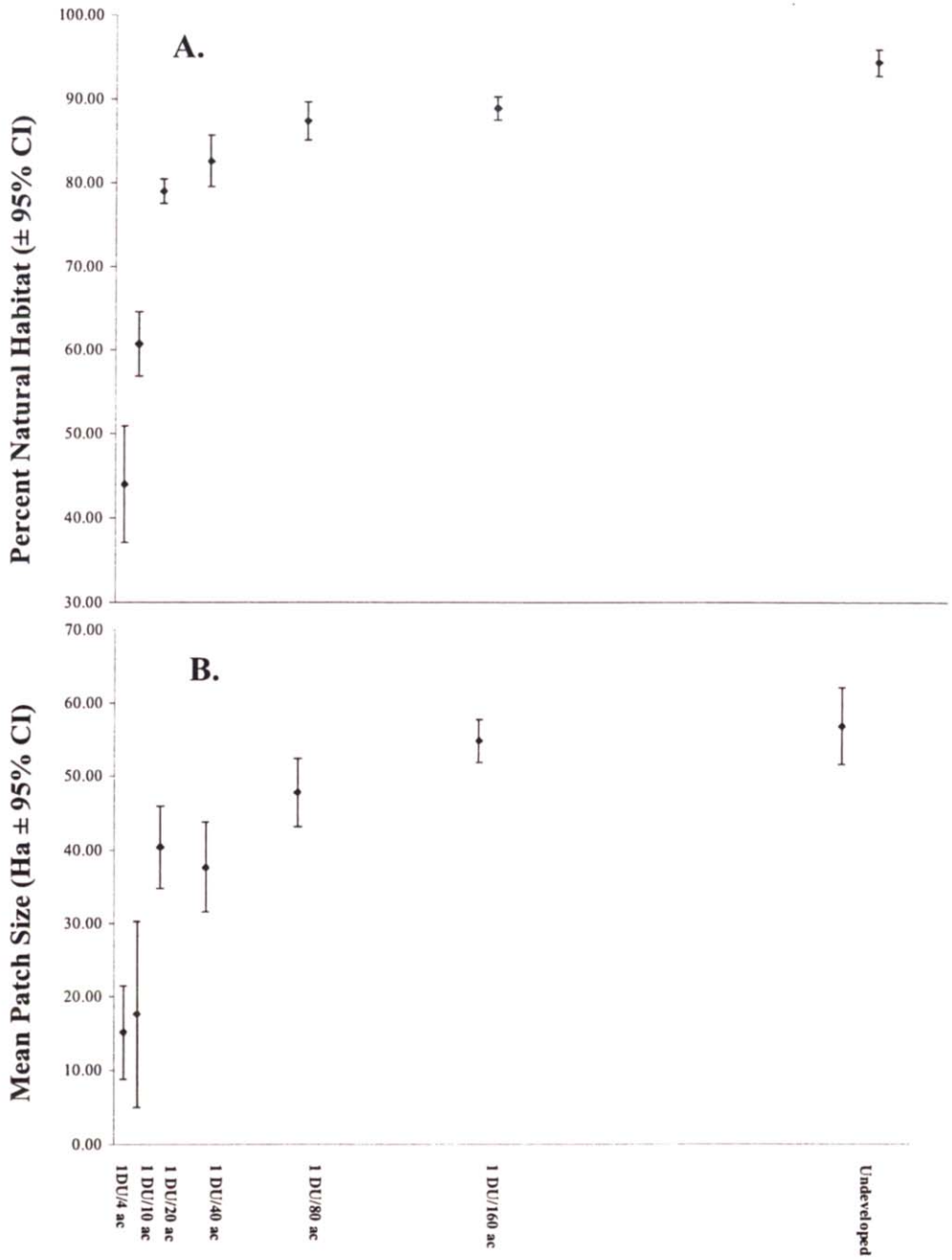


Figure 3. Fragmentation analysis results. **A.** Percent natural habitat per grid (mean ± 95% CI). **B.** Mean natural habitat patch size per grid (mean ± 95% CI).

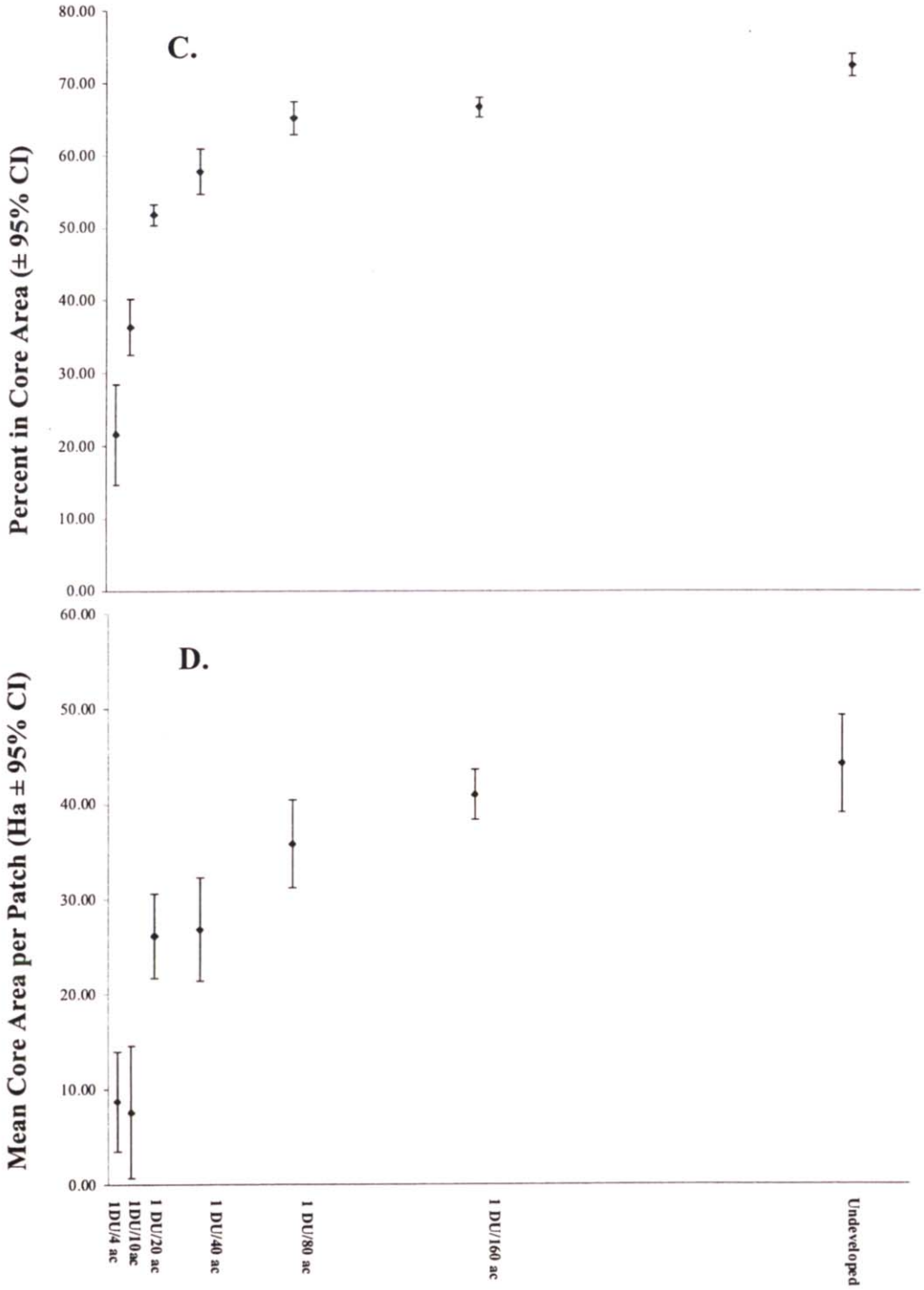


Figure 3. Fragmentation analysis results. **C.** Percent core area per grid (mean ± 95% CI). **D.** Mean core area per patch per grid (mean ± 95% CI).

The graphs show that total habitat area and habitat patch size decrease with increasing development density. For each of these graphs, the slope of the regression line is highest at densities above 1 DU/80 acre. This indicates that at densities of 1 DU/40 acre and above, incremental increases in density result in relatively large changes in fragmentation. At densities of 1 DU/80 acres and below, changes in fragmentation with changes in density are relatively small. Thus, in this analysis 1 DU/40 acres represents the threshold at which fragmentation appears to increase substantially, and we consider this to be the threshold density for significant fragmentation impacts.

4. COMPARISON OF GP-2020 ALTERNATIVES

While there are several geographic areas of difference in the Staff alternative and Board alternative, the major differences in their geographic allocation of DU density are shown in Figure 4. In this report, we use the following labeling convention: Staff /Board alternative (e.g., RL-160/RL-40) is the difference in the zoning of DU density in the Staff alternative (i.e., RL-160) relative to the Board alternative (i.e., RL-40), which are allocated to the same geographic unit. In Figure 4, the major areas with different zoning designations in the Staff and Board alternatives are mapped, with minor areas of zoning density difference aggregated in the category *Other*. In all instances, the Board alternative is zoned with higher DU densities than the same areas of the Staff alternative. Based on the areal extent of the Staff/Board categories across vegetation communities, the RL-80/RL-40, RL-160/RL-40, and RL-40/RL-20 categories account for 86% of the total difference between the two alternatives (i.e., 190,158 acres in these three categories, compared to 222,171 acres total, excluding areas that are mapped as Agriculture, Disturbed, and Developed in the current San Diego County vegetation database). The areas that would be affected by these differences correspond to the blue, orange, and magenta categories, respectively, in Figure 4.

To assess how these differences translate into potential effects on biological resources, we tabulated the acreage of vegetation communities in each category of Staff/Board alternative zoning density difference (Table 1). In the following sections, we describe the primary geographic areas and vegetation communities that will be affected for each of the three major Staff/Board alternative zoning density differences. Note that the total direct and indirect impacts of development at a particular development density within each category are unknown and will depend largely on distribution of housing within each zoning category (e.g., whether the housing is clustered or spread somewhat evenly throughout the development area), the amount and configuration of infrastructure (e.g., need for new roads), proximity to other areas of development, etc. Our focus in this section is on the general patterns of these different Staff/Board alternative development densities and how they will affect areas of the county with different biological resources, as described primarily by vegetation communities.

We also examine the potential effects of alternative zoning densities on existing ecological integrity in the county. Ecosystems of plant and animal species and their habitats are maintained by dynamic processes that operate across large landscapes. These ecological processes include disturbances from fire, flood, and soil erosion and deposition, as well as nutrient and energy flow through food webs, population dynamics, gene flow, and species interactions such as predation

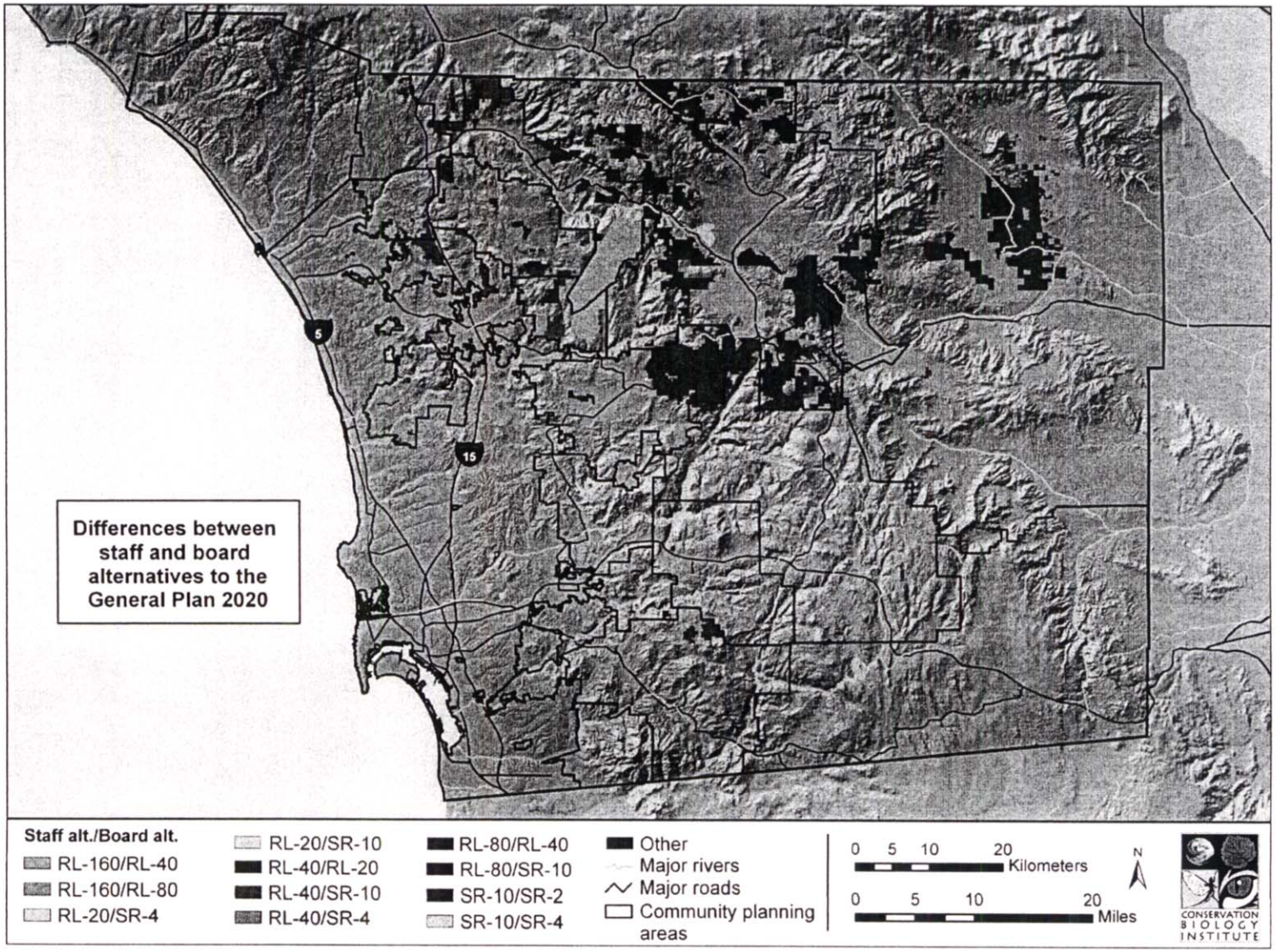


Figure 4. County of San Diego General Plan-2020—differences between the Staff and Board alternatives.

Table 1. Acreages of vegetation communities in County of San Diego General Plan-2020 categories where Staff and Board alternatives differ (Staff/Board).

Vegetation Category	RL-80/ RL-40	RL-160/ RL-40	RL-40/ RL-20	RL-160/ RL-80	Other	RL-40/ SR-10	RL-80/ SR-10	RL-40/ SR-4	RL-20/ SR-10	RL-20/ SR-4	SR-10/ SR-2	SR-10/ SR-4	**Total County
Beach/dunes	**428**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2,445**
Chaparral	**46,997**	**12,101**	**11,464**	**2,459**	**1,414**	**3,262**	**2,536**	**577**	**754**	**693**	**175**	**99**	**915,921**
Coastal scrub	**4,718**	**457**	**3,939**	**15**	**845**	**1,246**	**5**	**752**	**79**	**394**	**63**	**84**	**237,452**
Coniferous forest	**15,924**	**282**	**64**	**0**	**47**	**0**	**48**	**0**	**0**	**0**	**0**	**0**	**75,142**
Desert/montane scrub	**28,616**	**3,333**	**134**	**7,111**	**105**	**0**	**7**	**0**	**0**	**0**	**0**	**0**	**466,078**
Eucalyptus woodland	**116**	**2**	**12**	**2**	**37**	**0**	**0**	**0**	**0**	**2**	**0**	**12**	**3,416**
Grasslands													
Foothill/Mtn Perennial Grassland	3,190	2,004	0	1,029	5	0	10	0	0	0	0	5	25,194
Nonnative Grassland	2,064	4,861	1,359	5	853	109	37	0	20	0	44	12	63,336
Transmontane Dropseed Grassland	0	0	0	0	0	0	143	0	0	0	0	0	139
Valley and Foothill Grassland	1,535	1,001	15	0	279	44	20	7	0	7	0	0	25,331
Valley Needlegrass Grassland	67	94	7	0	0	0	121	0	0	0	0	0	30,819
Wildflower Field	84	0	0	0	0	0	0	0	0	0	0	0	1,517
Undifferentiated Grassland	55	0	4	0	0	0	0	0	0	0	0	0	864
Total Grasslands	**6,995**	**7,960**	**1,386**	**1,034**	**1,137**	**153**	**331**	**7**	**20**	**7**	**44**	**17**	**147,200**
Meadow, seep, and playa	**2,269**	**801**	**0**	**618**	**161**	**0**	**17**	**63**	**0**	**0**	**0**	**0**	**59,231**
Freshwater	**215**	**30**	**12**	**0**	**32**	**2**	**0**	**0**	**5**	**0**	**0**	**0**	**9,723**
Riparian/wetland	**4,580**	**798**	**428**	**1,883**	**264**	**59**	**35**	**44**	**0**	**22**	**32**	**27**	**83,619**
Woodlands													
Engelmann Oak Woodland	7,214	8,823	608	0	259	30	227	24	0	0	0	25	**34,880**
Black Oak Forest and Woodland	969	0	0	0	0	35	0	0	0	0	0	0	**1,526**
Coast Live Oak Woodland	6,608	1,945	1,216	2	413	450	662	36	109	22	24	27	**9,889**
Mixed Oak Woodland	5,835	1,317	0	0	74	0	0	0	0	0	0	0	**13,777**
Cismontane Woodland	0	5	0	0	0	0	0	0	0	0	0	0	**138**
Undifferentiated Woodland	568	593	0	0	0	0	0	0	0	0	0	0	**3,276**
Total Woodlands	**21,194**	**12,683**	**1,824**	**2**	**746**	**514**	**890**	**61**	**109**	**22**	**24**	**52**	**63,486**
Pinyon-Juniper	**22**	**376**	**0**	**739**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**53,493**
Barren	**0**	**0**	**0**	**15**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**613**
Total Vegetation Communities*	**132,072**	**38,822**	**19,264**	**13,879**	**4,788**	**5,237**	**3,869**	**1,503**	**966**	**1,141**	**338**	**292**	**2,499,800**

Source: County of San Diego.

*Excludes Agriculture, Disturbed, and Developed.

**Total acreage of these community types in county (not total acreage of all vegetation communities in county).

and competition, which can be adversely affected by human modifications of the landscape. The ecological integrity of a landscape refers to the extent that it remains free of human modifications, which is an indication of the ability of ecosystems to function naturally. We measured ecological integrity in San Diego County, using 574-acre grids (5,000 ft on a side) as the unit of analysis, using the distribution of roads and urban and agricultural development as a measure of the loss of ecological integrity (Figure 5, Appendix A).

RL-80/RL-40

This category of Staff/Board alternative difference totals 132,072 habitat acres, by far the largest acreage of difference between the two alternatives. The land in this category is distributed throughout the northeastern portion of the unincorporated area, largely within the Palomar, North Mountain, Julian, and Borrego Springs community planning areas (Figure 4). This difference category would affect various chaparral communities (46,997 acres), desert/montane scrub communities (28,616 acres of primarily desert shrub communities), woodlands (21,194 acres of primarily coast live oaks and Engelmann oaks), coniferous forests (15,924 acres of primarily mixed oak and coniferous/bigcone/Coulter pine), grasslands (6,995 acres of primarily native grasslands), and riparian/wetland communities (4,580 acres, half of which is mesquite bosque). Most of the land in this category is in areas supporting high and very high ecological integrity within the last remaining large core biological resources areas in San Diego County (Figure 5; Stallcup et al. 2005).

Increasing the housing density within this very large area of the county from 1 DU/80 acres to 1 DU/40 acres would have widespread and significant impacts to a variety of sensitive communities. Research on the effects of exurban development shows that even densities as low as 1DU/40-50 acres produce significant negative effects on native communities (Friesen et al. 1995, Maestas et al. 2001, Odell and Knight 2001). Our fragmentation analysis for San Diego County also shows that areas with densities of 1 DU/40 acres are more fragmented than areas with lower densities, such as 1 DU/80acres. At the RL-80 zoning, 1,651 houses would be allowed on the land within this category; at the RL-40 zoning, this number would increase to 3,301 houses. The additional 1,650 DUs that could be built under the Board alternative, along with all of the infrastructure requirements and indirect effects associated with them, would produce substantially increased fragmentation, negative impacts to wildlife communities, greater area of impervious surfaces, and increased water use.

RL-160/RL-40

This category of Staff/Board alternative difference totals 38,822 habitat acres, and occurs in some of the most intact and important habitat in San Diego County. The land in this category is located largely within two major areas, Rancho Guejito and the Santa Ysabel Valley (Figure 4). This category is also scattered within the Desert community planning area. Development in this category will affect oak woodlands (12,683 acres of primarily coast live and Engelmann oak woodlands), various chaparral communities (12,101 acres), grasslands (7,960 acres), and various desert/montane scrub communities (3,333 acres). Most of the land in this category is in areas supporting high and very high ecological integrity within the last remaining large core biological

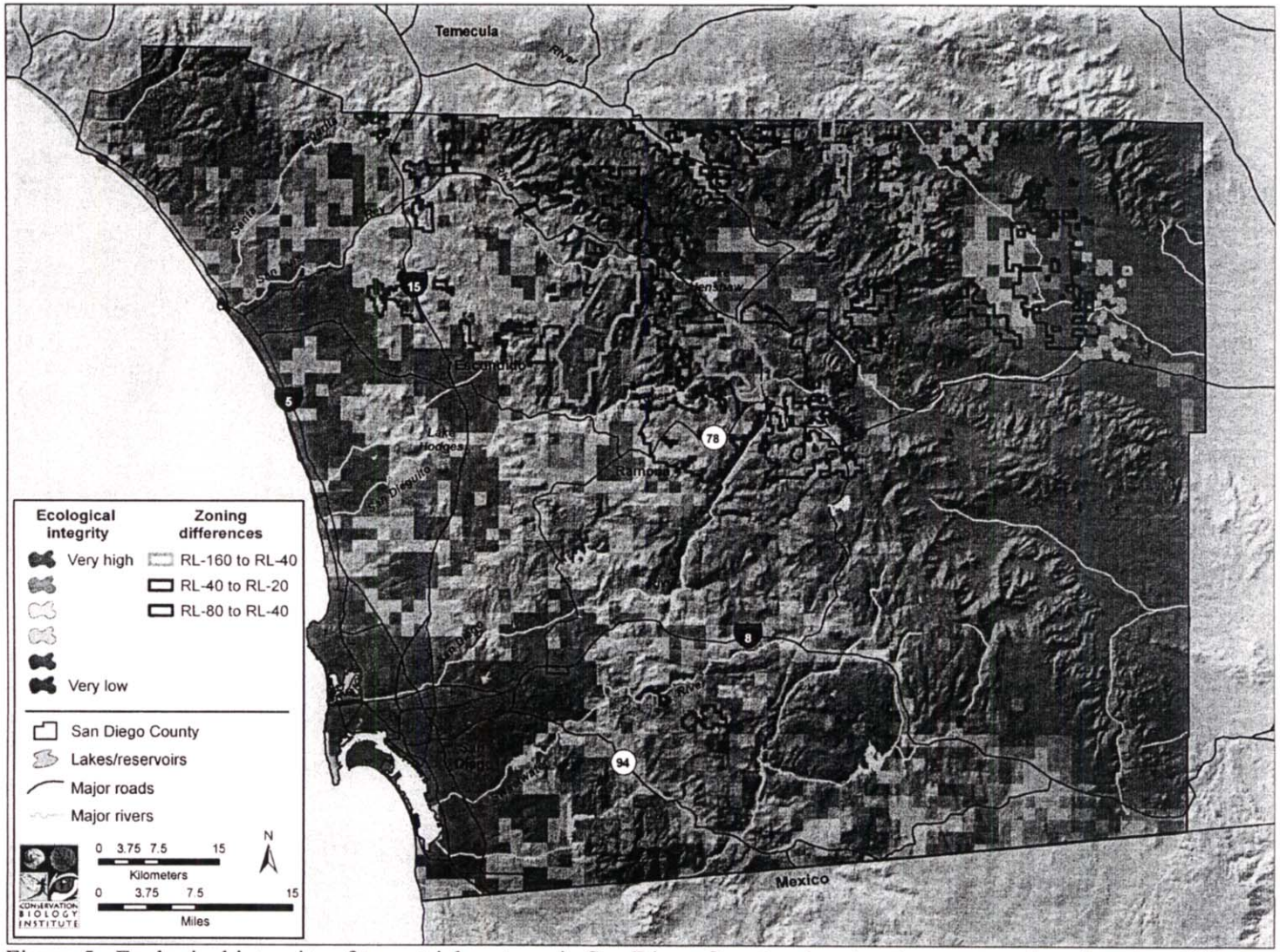


Figure 5. Ecological integrity of terrestrial systems in San Diego County, showing three categories of zoning difference between the Staff alternative and Board alternative of the General Plan-2020.

resources areas in San Diego County (Figure 5, Stallcup et al. 2005). In addition, Rancho Guejito represents the largest and most intact core area within the County of San Diego's North County Multiple Species Conservation Program (MSCP) Pre-Approved Mitigation Area (PAMA). Based on our empirical analysis of fragmentation, increasing housing density from 1 DU/160 acres to 1 DU/40 acres significantly decreases mean patch size and percent of core area. In addition, significant changes in wildlife composition have been noted at densities of 1 DU/ 40 acres, with human-sensitive species decreasing in abundance. At the RL-160 zoning, 243 houses would be allowed on the land within this category; at the RL-40 zoning, this would increase by 728 units to 971 houses along with the increased impervious surface cover, water use, and indirect effects to biological resources.

RL-40/RL-20

This category of Staff/Board alternative difference totals 19,264 habitat acres and is geographically distributed primarily in the northwestern portion of the unincorporated area (Fallbrook, Valley Center, Bonsall, Hidden Meadows, Twin Oaks, North County Metro, and Pala-Pauma community planning areas), the northwestern portion of the Jamul-Dulzura community plan area, and scattered locations in the eastern portion of the county (Figure 4). Vegetation communities that would be affected to the largest extent include chaparral (11,464 acres of primarily southern mixed chaparral), sage scrub (3,939 acres of primarily Diegan coastal sage scrub), oak woodlands (1,824 acres of coast live oak and Engelmann oak woodland), and grasslands (1,386 acres of primarily nonnative grassland, Table 1). Several areas of RL-40/RL-20 are located within the PAMA for the North County MSCP, including areas of very high and high ecological integrity (Figure 5).

Increasing housing density from 1 DU/40 acres to 1 DU/20 acres would have significant effects on biological resources. As discussed above, the magnitude of biological impacts increases along an urbanization or housing density gradient, with greater impacts in areas of high DU density (Medley et al. 1995, McDonnell et al. 1997). This is consistent with the empirical trend of increasing disturbance and fragmentation with increasing DU density from our fragmentation analysis (Section 3). Odell and Knight (2001) documented increases in human-tolerant wildlife species at the expense of human-intolerant wildlife species at DU densities above 1 DU/40 acres. Likewise, our fragmentation analysis shows fragmentation tends to be higher at DU densities of 1 DU/20 acres relative to 1 DU/40 acres. For example, average number of vegetation patches tends to be higher at 1 DU/20 acres than at 1 DU/40 acres, and the percentage of natural vegetation and percentage of core area tend to be lower at 1 DU/20 acres than at 1 DU/40 acres. Within the 19,264 acres of this DU density difference category, 482 DUs would be allowed under the RL-40 zoning, while 963 DUs would be allowed under the RL-20 zoning. Thus, an additional 481 DUs would be allowed, along with their associated roads and infrastructure, disturbance in fuel management zones, impervious surface cover, domestic animals, and ornamental plants, all factors contributing to fragmentation and adverse impacts to natural resources.

Areas of High Ecological Integrity and Existing Conservation Investments

Enormous investments by federal, state, and local governments have been made in the acquisition and conservation of natural lands in San Diego County, and these investments will be jeopardized if the lands are not linked and managed within a network of conserved landscapes of sufficient size, integrity, and connectivity. The importance of conserving private land within large blocks of core habitats to landscape-scale ecological functions is emphasized when considering the distribution of the remaining core habitat blocks of very high ecological integrity in San Diego County (Figure 5, Appendix A). Much of the habitat in the coastal portion of the county has been lost or degraded by development. Within the central foothills of the county, there are basically three intact blocks of habitat remaining: (1) Rancho Guejito-Santa Ysabel Valley (ca. 72,000 acres), (2) Eagle Peak-Capitan Grande Indian Reservation (ca. 105,000 acres), and (3) Otay Mountain Wilderness-Tecate Peak (ca. 100,000 acres), each of which is contiguous with adjacent intact habitat blocks of montane and desert habitat to the east. These three blocks of habitat are core areas of the regional system of natural lands in the western portion of San Diego County. Maintaining their core area functions is critical to maintaining (1) biodiversity throughout the region, including the biodiversity of smaller patches of habitat within Natural Community Conservation Planning (NCCP) reserves to the west, and (2) connectivity with higher elevation conservation areas to the east, e.g., Cleveland National Forest, Palomar Mountain State Park, and Agua Tibia Wilderness.

Moreover, much of the area that is zoned RL-40 by the Board alternative and RL-80 or RL-160 by the Staff alternative lies within the upper portions of the San Dieguito River, San Luis Rey River, and San Felipe Creek watersheds. Enormous conservation investments have already been made in these watersheds. For example, in the San Dieguito River watershed downstream of these areas, more than 2,200 acres have already been protected in the San Pasqual Valley alone. Protection of the watershed functions and values of these upper watershed areas builds on these investments and contributes to their long-term protection.

5. DIFFERENCES IN IMPACTS TO VEGETATION COMMUNITIES BETWEEN ALTERNATIVES

In Sections 2 and 3, we examined the effects of different residential development densities on biological communities using a review of relevant scientific literature and an analysis of habitat fragmentation patterns associated with different development densities in San Diego County, respectively. In both instances, it was demonstrated that densities of about 1 DU/40 acres and higher result in markedly greater direct and indirect impacts to species and communities as a result of habitat loss, fragmentation, and changes in species composition than do densities lower than 1 DU/40 acres. In this analysis, we use 1 DU/40 acres as a threshold for significant impacts to biological resources, i.e., densities of 1DU/40 acres or higher are considered to result in significant impacts to biological resources. While there are also potentially significant differences in impacts at densities lower than 1 DU/40 acres (e.g., 1 DU/80 acres vs. 1DU/160 acres), as suggested by the empirical evidence for San Diego County (Figure 3), there is little research that has examined the effects of development densities much lower than 1 DU/40 acres.

To better illustrate the implications of zoning differences between the Staff and Board alternatives to natural resources in San Diego County, this section focuses on vegetation communities and associated sensitive species that would be significantly impacted by zoning development densities at 1 DU/40 acres or higher and where potential impacts of these development densities would affect a significant proportion of the county-wide distribution of rare vegetation communities.

Table 2 shows acreages of different vegetation communities directly impacted by zoning densities of 1 DU/40 acres and higher and acreages directly impacted by zoning densities of lower than 1 DU/40 acres for the Staff and Board alternatives. Overall, the Board alternative results in 173,608 acres more in development densities ≥1 DU/40 acres than does the Staff alternative (502,766 – 329,158 acres, Table 2). This includes approximately 132,000 acres where the Staff alternative is RL-80 and the Board alternative is RL-40, 38,800 acres where the Staff alternative is RL-160 and the Board alternative is RL-40, and 3,800 acres where the Staff alternative is RL-80 and the Board alternative is SR-10 (Table 1). [Note that there is a total difference of about 1,000 acres between Tables 1 and 2 as a result of GIS database inconsistencies between the two alternatives. This difference does not affect the conclusions of this analysis.] These greater levels of impacts associated with the Board alternative would occur primarily in the north-central and north-eastern portions of the county (Figure 4).

Rare Vegetation Communities

The areas where the Staff alternative proposes densities lower than 1 DU/40 acres and the Board alternative proposes densities equal to or higher than 1 DU/40 acres (i.e., Staff/Board categories RL-80/RL-40, RL-160/RL-40, and RL-80/SR-10; Table 3) support a significant percentage of communities that are naturally rare in Southern California and which have been further reduced in extent via loss to development and type conversion (Oberbauer and Vanderwier 1991, Scott 1991). Oak woodlands, grasslands, coniferous forests, and wetlands are considered rare by the County of San Diego's Biological Mitigation Ordinance, which lists them as Tier I communities, i.e., communities that are limited in distribution and that support rare or listed species. Impacts to Tier I communities must be mitigated in-kind or by conservation of other communities within Tier I, indicating the irreplaceable nature of these resources.

Table 3 shows how these communities would be differentially impacted by the Staff and Board alternatives in the aforementioned three zoning categories. In summary,

- Oak woodlands in these three categories total 34,766 acres or 55% of all of the oak woodlands in San Diego County.
- Of the oak woodlands, 16,264 acres are comprised of Engelmann oak woodlands, representing 47% of all Engelmann oak woodlands in the county.
- Coniferous forests in these categories represent 16,254 acres or 22% of all coniferous forests in the county.
- Grasslands in these three categories total 15,286 acres or about 10% of the grasslands in the entire county.

Table 2. Acreages of vegetation communities impacted by zoning densities of 1 DU/40 acres and higher and acreages impacted by zoning densities lower than 1 DU/40 acres.

STAFF ALTERNATIVE	Zoning Description**				Total***
Vegetation Category	**>1DU/40**	**RL-40**	**RL-80**	**RL-160**	
Beach/dunes	2	72	468	0	543
Chaparral	68,182	99,330	97,281	15,789	280,582
Coastal scrub	43,307	20,418	7,064	482	71,270
Coniferous forest	3,555	2,303	17,561	282	23,701
Desert/montane scrub	14,494	6,070	41,501	10,618	72,683
Eucalyptus woodland	1,470	45	157	6	1,678
Grasslands	19,897	7,159	9,664	8,992	45,711
Meadow, seep, and playa	388	1,219	4,123	1,436	7,166
Freshwater	431	250	362	31	1,073
Riparian/wetland	9,163	6,357	6,744	2,805	25,069
Woodlands	12,010	13,036	28,324	12,311	65,681
Pinyon-Juniper	0	0	22	1,115	1,137
Total Vegetation Communities*	**172,899**	**156,259**	**213,270**	**53,866**	**596,295**

Total ≥ 1DU/40 acres = 329,158

BOARD ALTERNATIVE	Zoning Description**				Total***
Vegetation Category	**>1DU/40**	**RL-40**	**RL-80**	**RL-160**	
Beach/dunes	2	496	45	0	542
Chaparral	86,338	143,880	50,221	0	280,439
Coastal scrub	49,280	19,649	2,388	0	71,316
Coniferous forest	3,672	15,429	4,577	0	23,677
Desert/montane scrub	14,516	38,265	20,036	0	72,818
Eucalyptus woodland	1,498	152	47	0	1,697
Grasslands	21,867	21,008	3,460	0	46,335
Meadow, seep, and playa	512	4,317	2,459	0	7,287
Open water	461	473	155	0	1,088
Riparian/wetland	9,781	11,414	3,996	0	25,191
Woodlands	15,446	43,914	6,436	0	65,796
Pinyon-Juniper	0	398	740	0	1,138
Total Vegetation Communities*	**203,373**	**299,393**	**94,559**	**0**	**597,325**

Total ≥ 1DU/40 acres = 502,766

*Excludes Agriculture, Disturbed, and Developed.

**Excludes military, tribal lands, national forest, state parks, public/semi-public lands, and other open space.

***Differences in Totals reflect inconsistencies in the way the alternatives are presented in the GIS database.

Table 3. Acreages of vegetation communities in 3 General Plan-2020 categories where Staff alternative density is less than 1 DU/40 acres and Board alternative density is greater than or equal to 1 DU/40 acres (Staff/Board).

Vegetation Category	RL-80/ RL-40	RL-160/ RL-40	RL-80/ SR-10	SUM	**Total County
Beach/dunes	**428**	**0**	**0**	**428**	**2,445**
Chaparral	**46,997**	**12,101**	**2,536**	**61,634**	**915,921**
Coastal scrub	**4,718**	**457**	**5**	**5,180**	**237,452**
Coniferous forest	**15,924**	**282**	**48**	**16,254**	**75,142**
Desert/montane scrub	**28,616**	**3,333**	**7**	**31,956**	**466,078**
Eucalyptus woodland	**116**	**2**	**0**	**119**	**3,416**
Grasslands					
Foothill/Mountain Perennial Grassland	3,190	2,004	10	5,205	25,194
Nonnative Grassland	2,064	4,861	37	6,962	63,336
Transmontane Dropseed Grassland	0	0	143	143	139
Valley and Foothill Grassland	1,535	1,001	20	2,555	25,331
Valley Needlegrass Grassland	67	94	121	282	30,819
Wildflower Field	84	0	0	84	1,517
Undifferentiated Grassland	55	0	0	55	864
Total Grasslands	**6,995**	**7,960**	**331**	**15,286**	**147,200**
Meadow, seep, and playa	**2,269**	**801**	**17**	**3,087**	**59,231**
Freshwater	**215**	**30**	**0**	**245**	**9,723**
Riparian/wetland	**4,580**	**798**	**35**	**5,413**	**83,619**
Woodlands					
Engelmann Oak Woodland	7,214	8,823	227	16,264	**34,880**
Black Oak Forest and Woodland	969	0	0	969	**1,526**
Coast Live Oak Woodland	6,608	1,945	662	9,216	**9,889**
Mixed Oak Woodland	5,835	1,317	0	7,152	**13,777**
Cismontane Woodland	0	5	0	5	**138**
Undifferentiated Woodland	568	593	0	1,162	**3,276**
Total Woodlands	**21,194**	**12,683**	**890**	**34,766**	**63,486**
Pinyon-Juniper	**22**	**376**	**0**	**398**	**53,493**
Barren	**0**	**0**	**0**	**0**	**613**
Total Vegetation Communities*	**132,072**	**38,822**	**3,869**	**174,764**	**2,455,136**

Source: County of San Diego.

*Excludes Agriculture, Disturbed, and Developed.

**Total acreage of these community types in county (not total acreage of all vegetation communities in county).

- Riparian and wetland communities in these categories total 5,413 acres or >6% of the mapped riparian and wetland communities in the county (because of their scale, some of these wetlands may be under-mapped).

The following sections describe the importance of these communities to rare species in the county, with a focus on oak woodlands and grasslands, which are under-represented in protected areas in the region and in San Diego County (Stallcup et al. 2005). Appendix B lists selected sensitive, rare, and endangered species and their vegetation community associations, which are likely to be most impacted by increased development densities, based on our analysis of vegetation community impacts in specific geographic locations in the county.

Oak woodlands

Oaks are a *keystone* species of biological diversity in Southern California, because they provide habitat and food sources for thousands of other species and profoundly influence ecological communities (Pavlik et al. 1991). Indeed oaks are often recognized as a cultural icon of California landscapes, dating back to their importance to early Indian groups that settled here. In San Diego County, oak woodlands (communities shown in Tables 1 and 3) are most abundant in the central foothills, from Cedar Creek north to Santa Ysabel Valley and west to Rancho Guejito. The Engelmann oak, which is endemic to Riverside and San Diego counties in the U.S. and northern Baja California, has the smallest range of any oak in California (Lathrop and Osborne 1990), with the majority of its distribution in San Diego County (Scott 1991).

Engelmann oak woodlands in the RL-160/RL-40, RL-80/RL-40, and RL-80/SR-10 categories represent almost half of Engelmann oak woodlands mapped in San Diego County (Table 3), including some of the largest trees and largest stands of Engelmann oak woodlands in the county (PSBS et al. 1993). Therefore, decisions concerning residential densities in these areas have huge implications for conservation of oaks in San Diego County, including the rare Engelmann. In the Board alternative, densities of RL-40 and higher would impact 34,314 acres more oak woodlands than in the Staff alternative (59,360 acres in the Board alternative vs. 25,046 acres in the Staff alternative, Table 2). Engelmann oaks represent approximately half of this impact.

Other sensitive species likely to be adversely impacted by loss and fragmentation of oak woodland habitats include the mountain lion, mule deer, Cooper's hawk, which commonly nests in oak woodlands, western bluebird, and several different species of sensitive plants that are rare or have limited distributions, such as the Ramona horkelia, felt-leaved monardella, and San Miguel savory (Appendix B). These sensitive species would be significantly adversely affected by the increased area of oak woodlands that would be zoned at ≥1 DU/40 acres in the Board alternative, as a result of habitat loss and fragmentation, increases in human-tolerant species (e.g., starlings and scrub jays), and increased potential for human-wildlife encounters and roadkill.

Coniferous forests

Coniferous forests in these three categories within San Diego County include bigcone Douglas-fir, Coulter pine, Cuyamaca cypress, Jeffrey pine, white fir, mixed fir, and mixed pine associations. All of these associations are often mixed with oaks. Those communities that are most limited in their regional distribution are bigcone Douglas-fir (1,842 acres in category RL-80/RL-40, representing 23% of this association in the county) and Coulter pine (208 acres in category RL-80/RL-40, 208 acres in RL-160/RL-40, and 26 acres in RL-80/SR-10, representing 9% of this association in the county). Approximately 4,874 acres of mixed pine and fir forests are in category RL-80/RL-40. Coniferous forests in these categories represent 16,254 acres or 22% of all coniferous forests in the county, occurring mostly in the north-central portion of the county. In the Board alternative, densities ≥1 DU/40 acres would impact approximately 13,243 acres more coniferous forest than in the Staff alternative (19,101 acres in the Board alternative vs. 5,858 acres in the Staff alternative, Table 2).

The Coulter pine, a California endemic, reaches the end of its southern distributional limit in San Diego County, with a few scattered stands in northern Baja California (Griffin and Critchfield 1972, Minnich and Franco Vizcaíno 1998). Pine Mountain on Rancho Guejito is the westernmost of the disjunct populations in San Diego County. Almost 300 acres of Coulter pine would be impacted by high density development (≥1 DU/40 acres) proposed by the Board alternative that the Staff alternative proposes for lower densities than 1 DU/40 acres. Similarly, the bigcone Douglas fir relies on interconnected habitats for its long-term persistence and would be adversely impacted by loss and fragmentation of habitat.

In San Diego County and other parts of Southern California, the California spotted owl occurs as a series of small, relatively isolated populations in montane, late-seral stage, closed-canopy woodlands of oaks and conifers (Noon and McKelvey 1992, LaHaye et al. 1994, Unitt 2004). As a result of habitat loss and fragmentation, decline in habitat quality due to development, adverse effects to its habitat from groundwater drawdown resulting from new rural development and use for bottled drinking water, and intolerance of human activity near nest sites, spotted owl populations in Southern California are declining, with only 25-50 pairs estimated in San Diego County. Because of their low numbers and narrow habitat requirements, spotted owls may be especially susceptible to habitat loss. In addition, wide-ranging sensitive species such as mule deer and mountain lion, which use conifer habitats, would be significantly impacted by the increased area zoned for development densities of ≥1 DU/40 acres in the Board alternative, due to loss and fragmentation of their habitats, greater probability for human-wildlife encounters, and increased roadkill.

Grasslands

Grasslands have historically been undervalued as a resource in Southern California, as most of them have been planted with or heavily invaded by nonnative annual grasses, and, until the last decade, plant and animal species in these areas had not been listed by state and federal governments as Threatened or Endangered. Moreover, their locations on flat or gentle slope areas make them ideal for development.

Over the past decade, as significant acreage of grasslands in Southern California has been lost to development and, concurrently, populations of grassland species have declined, grasslands—both those mapped as native and nonnative—have become more valuable for conservation. Moreover, as field surveys are conducted in grasslands, biologists are finding that native grasses and forbs are still there, but have been overlooked because of the taller nonnative annuals. So, in many cases, areas mapped as nonnative grasslands are really a combination of native and nonnative species that still retain significant habitat values. Regardless of plant species composition, grasslands are a very important resource for wildlife.

Grasslands in the three aforementioned development density difference categories represent >10% of all grasslands in San Diego County (Table 3). In the Board alternative, densities ≥1 DU/40 acres would impact approximately 15,819 acres more grasslands than in the Staff alternative (42,875 acres in the Board alternative vs. 27,056 acres in the Staff alternative, Table 2).

The grasslands on Rancho Guejito and in Santa Ysabel Valley (category RL-160/RL-40) comprise about half of the 15,819-acre difference between the higher density categories of the two alternatives (Table 2) and are particularly significant because of their overall size and integrity. Large grassland patches are rare in San Diego County (Table 4), and the largest are not conserved for their biological values. Therefore, decisions concerning residential densities in these areas have huge implications for the county's remaining grasslands.

Large, intact grasslands, provide habitat for declining species such as raptors, badgers, grasshopper sparrows, burrowing owls, and Stephens' kangaroo rats. These species, among other grassland species considered sensitive by the County of San Diego (Appendix B), are known to use the grasslands and associated oak savannas in the three aforementioned development density difference categories.

Table 4. Largest grassland complexes in San Diego County.

Location	Approx. Size* (acres)
Camp Pendleton	45,000
Lake Henshaw	16,000
Santa Ysabel/Mesa Grande	5,400
Rancho Guejito	4,900
Ramona	2,000
Otay/Sweetwater NWR	1,900

*Based on San Diego County vegetation data.

Based on the extent, type and quality of suitable habitat (uncultivated grasslands and savannas on friable soils), and availability of prey (primarily rodents), the grasslands within the areas zoned for ≥1 DU/40 acres in the Board alternative may support the few sustainable populations of badgers remaining in San Diego County. Badgers have relatively large home ranges, with some estimates as large as >4,000 acres (Sargeant and Warner 1972), and young badgers have been

recorded to disperse as far as 68 miles from their natal ranges (Lindzey 2003), making the availability of large, intact grassland areas necessary for their persistence. Increasing development densities to ≥1 DU/40 acres across over 15,000 acres of grasslands in the county would result in greatly increased fragmentation and human disturbance of badger habitat and is considered a significant impact to this sensitive species.

The large expanses of grasslands in areas zoned for ≥1 DU/40 acres in the Board alternative and <1 DU/40 acres in the Staff alternative support at least 16 different raptor species:

Turkey vulture (*Cathartes aura*)
Bald eagle (*Haliaeetus leucocephalus*)
Northern harrier (*Circus cyaneus*)
Sharp-shinned hawk (*Accipter striatus*)
Cooper's hawk (*Accipter cooperii*)
Red-shouldered hawk (*Buteo lineatus*)
Red-tailed hawk (*Buteo jamaicensis*)
Ferruginous hawk (*Buteo regalis*)
Golden eagle (*Aquila chrysaetos*)
American kestrel (*Falco sparverius*)
Merlin (*Falco columbarius*)
Prairie falcon (*Falco mexicanus*)
Barn owl (*Tyto alba*)
Great horned owl (*Bubo virginianus*)
Western screech owl (*Otus kennicottii*)
Burrowing owl (*Athene cunicularia*)

Large grasslands with abundant prey resources are crucial to raptor populations that breed, winter, or migrate through San Diego County. The loss and fragmentation of habitat, increase in human-tolerant species (a number of which can be nest predators), and increased human uses of grassland areas associated with increasing development densities to ≥1 DU/40 acres under the Board alternative will diminish habitat quality for these species, resulting in significant adverse impacts.

The grasslands on Rancho Guejito (in Staff/Board category RL-160/RL-40) also support one of the largest remaining populations of the endangered Stephens' kangaroo rat—second in size only to the Warner Basin area among the San Diego populations (Table 5), and it appears comparable or slightly smaller (based on actually occupied habitat acreage) to the two largest Riverside County *core* populations. Development can directly affect Stephens' kangaroo rat habitat via direct loss and indirectly affect its habitat by adversely affecting our ability to manage its habitat via grazing or prescribed fire. This species is sensitive to changes in grassland structure that would accompany eliminating these disturbances in residential areas. Thus, increasing development densities to ≥1 DU/40 acres on Rancho Guejito under the Board alternative would be considered a significant impact to this species.

Riparian and wetland communities

Riparian associations in the county include white alder riparian forest, southern cottonwood-willow riparian forest, southern coast live oak riparian forest and woodland, southern sycamore-alder riparian woodland, riparian forest and scrub, southern willow scrub, and mule fat scrub. Riparian and wetland communities are the life blood of many sensitive, rare, and endangered species that rely on these habitats for some or all of their life histories (Appendix B). Of all the categories in Table 1, the RL-80/RL-40 category would affect the greatest acreage of riparian and wetland communities (4,580 acres), followed by the RL-160/RL-80 category (1,883 acres). In the Board alternative, densities ≥1 DU/40 acres would affect approximately 5,675 acres more

Table 5. Approximate area of occupied Stephens' kangaroo rat habitat for the largest remaining habitat areas in Riverside and San Diego counties.

Location	Occupied Habitat	
	Hectares	Acres
Riverside County		
Lake Matthews-Estelle Mountain	1,726	4,264
Lake Perris-San Jacinto	1,528	3,775
Lake Skinner-Dominigoni Valley	805	1,988
Sycamore Canyon-March Air Force Base	548	1,355
Motte Rimrock-Steele Peak	484	1,195
San Diego County		
Lake Henshaw-Warner Basin	4,600	11,370
Rancho Guejito	1,219	3,012
Ramona Grasslands	~243	~600
Marine Corps Base Camp Pendleton	~160	~400
Fallbrook Naval Weapons Station	<160	<400

Source: USFWS (1997), Montgomery (2005), Ogden (1998), and S.J. Montgomery and W. Spencer unpublished data.

riparian and wetland communities than in the Staff alternative (21,195 acres in the Board alternative vs. 15,520 acres in the Staff alternative, Table 2). Many of the direct impacts to wetlands may be avoided by development, but impacts to wetlands via indirect effects, such as increasing impervious surfaces in their watersheds or groundwater withdrawals, can be far greater than direct impacts.

Because development can reduce the integrity of watersheds and modify the magnitude, frequency, duration, timing, and rate of discharge of stream systems, aquatic and riparian communities that depend on a natural flow regime are ultimately affected, as are the species they support. Impacts to watershed basins in the central foothills of the county, which support the headwaters of all of our coastal drainages, will have cascading effects downstream. For example, development in the RL-160/RL-40 and RL-80/RL-40 categories would have adverse impacts to lands downstream in the San Luis Rey, San Dieguito, and San Diego River watersheds, including lands that have been conserved as part of the MSCP. In the San Pasqual Valley alone, this could result in adverse impacts to core breeding populations of the endangered least Bell's vireo and southwestern willow flycatcher, communities of other neotropical migrant bird species that breed in San Diego County, and a core population of the endangered arroyo toad (CBI 2003, Appendix B). Riparian and wetland communities also provide important habitat for wide-ranging species like the mountain lion and mule deer, and the increased area with densities ≥1 DU/40 acres in the Board alternative would result in greater potential for significant adverse effects to these species from increased human encounters.

6. CONCLUSIONS

Based on our analysis of the two GP-2020 alternatives, we conclude that the Staff alternative is environmentally superior to the Board alternative, and implementing the Board alternative would result in significantly greater impacts to natural resources, especially rare resources, as a result of greater direct loss of habitat, greater habitat fragmentation, and greater indirect impacts to habitats and species.

Our review of the peer-reviewed scientific literature concerning the effects of development density on natural resources found that significant adverse effects can be detected at densities as low as 1 DU/50 acres and that the magnitude of these adverse impacts increases as development densities increase. Significant adverse effects include greater abundance of nonnative plants and altered vegetation structure, increased availability of human-subsidized food and water supplies, increased abundance of human-tolerant wildlife, and decreased abundance of human-intolerant wildlife species, likely as a result of competition with human-tolerant species in human-altered environments.

To supplement the information available from the published scientific literature, we conducted an empirical investigation of habitat fragmentation at varying development densities in San Diego County. Consistent with the published literature, we found that the magnitude of fragmentation increases along a gradient of increasing development density. Also consistent with the literature, we found that 1 DU/40 acres appears to be a threshold at which there is significant habitat fragmentation. At densities lower than 1 DU/40 acres fragmentation decreases slowly and is similar to undeveloped habitat, and at densities above 1 DU/40 acres fragmentation is greater and increases rapidly with increasing development density. Therefore, for the purposes of this analysis, we consider development at densities of 1 DU/40 acres or higher to result in significantly greater biological impacts than development at densities less than 1 DU/40 acres.

Comparing density zoning maps from the two GP-2020 alternatives, there are approximately 174,000 acres more of the county zoned at 1 DU/40 acres or higher in the Board alternative than in the Staff alternative. Much of the 174,000 acres is located in parts of the county supporting sensitive and under-protected vegetation communities (e.g., grasslands, Engelmann oak woodlands) that support sensitive, rare, and endangered species (e.g., Stephens' kangaroo rat, burrowing owl, golden eagle and other raptors, arroyo toads, Appendix B). Thus, there would be significant adverse impacts to these and other sensitive species as a result of the substantially increased acreage of habitat loss and fragmentation associated with development densities of 1 DU/40 acres or higher under the Board alternative. Furthermore, much of the 174,000 acres is located in parts of the county that have high existing ecological integrity and that form parts of regionally important blocks of biological core areas (e.g., Rancho Guejito-Santa Ysabel core). Based on the best available scientific information, supplemented with our empirical analyses, we conclude that the Board alternative has significantly greater adverse impacts to biological resources than the Staff alternative and, because of the nature and location of these impacts, they would be unmitigable.

7. REFERENCES

Alberts, A.C., A.D. Richman, D. Tran, R. Sauvajot, C. McCalvin, and D.T. Bolger. 1993. Effects of habitat fragmentation on native and exotic plants in Southern California coastal scrub. Pages 103-110 *in* Keeley, J.E. (ed.), Proceedings of the symposium: interface between ecology and land development in California. May 1-2, 1992; Occidental College, Los Angeles, CA.

Andren, H. and P. Angelstam. 1988. Elevated predation rates as an edge effect in habitat islands: experimental evidence. Ecology 69:544-547.

Andren, H., P. Angelstam, E. Lindstrom, and P. Widen. 1985. Differences in predation pressure in relation to habitat fragmentation: an experiment. Oikos 45:273-277.

Angelstam, P. 1986. Predation in ground-nesting birds' nests in relation to predator densities and habitat edge. Oikos 47:367-373.

Beier, P. 1995. Dispersal of juvenile cougars in fragmented habitat. J. Wildlife Management 59:228-237.

Blair, R.B. 1996. Land use and avian species diversity along an urban gradient. Ecological Applications 6(2):506-519.

Blair, R.B. 1999. Birds and butterflies along an urban gradient: surrogate taxa for assessing biodiversity? Ecological Applications 9(1):164-170.

Blair, R.B., and A.E. Launer. 1997. Butterfly diversity and human land use: species assemblages along an urban gradient. Biological Conservation 80:113-125.

Bolger, D.T., A.C. Alberts, and M.E. Soulé. 1991. Occurrence patterns of bird species in habitat fragments: sampling, extinction, and nested species subsets. American Naturalist 137:155-166.

Booth, D.B., and C.R. Jackson. 1994. Urbanization of aquatic systems—degradation thresholds and the limits of mitigation. Pages 425-434 *in* American Water Resources Association, Effects of human-induced changes on hydrologic systems. June.

Brooks, T.M., R.A. Mittermeier, C.G. Mittermeier, G.A.B. da Fonseca, A.B. Rylands, W.R. Konstant, P. Flick, J. Pilgrim, S. Oldfield, G. Magin, and C. Hilton-Taylor. 2002. Habitat loss and extinction in the hotspots of biodiversity. Conservation Biology 16:909-923.

Brothers, T.S., and A. Spingarn. 1992. Forest fragmentation and alien plant invasion of central Indiana old-growth forests. Conservation Biology 6(1):91-100.

Cody, M.L. 1993. Theoretical and empirical aspects of habitat fragmentation. Pages 93-102 *in* Keeley, J.E. (ed.), Proceedings of the symposium: interface between ecology and land development in California. May 1-2, 1992; Occidental College, Los Angeles.

Crooks, K.R. 2002. Relative sensitivities of mammalian carnivores to habitat fragmentation. Conservation Biology 16:488-502.

Czech, B., K. Doyle, J. Kostyack, B. McNitt, G. Sugameli, C. Whitaker, K. Whitcomb-Blylock, J. Byrd, and G. Stall. 2001. Paving paradise: sprawl's impact on wildlife and wild places in California. Unpublished report, National Wildlife Federation.

Donnelly, R., and J.M. Marzluff. 2004. Importance of reserve size and landscape context to urban bird conservation. Conservation Biology 18(3):733-745.

Dunne, T., and L.B. Leopold. 1978. Water in environmental planning. W.H. Freeman Co., San Francisco, CA.

Friesen, L.E., P.F.J. Eagles, and R.J. Mackay. 1995. Effects of residential development on forest-dwelling neotropical migrant songbirds. Conservation Biology 9:1408-1414.

Germaine, S.S., and B.F. Wakeling. 2001. Lizard species distributions and habitat occupation along an urban gradient in Tucson, Arizona, USA. Biological Conservation 97:229-237.

Germaine, S.S., S.S. Rosenstock, R.E. Schweinsburg, and W.S. Richardson. 1998. Relationships among breeding birds, habitat, and residential development in greater Tucson, Arizona. Ecological Applications 8:680-691.

Gordon, N.D., T.A. McMahon, and B.L. Finlayson. 1992. Stream hydrology: an introduction for ecologists. John Wiley & Sons Ltd., Baffins Lane, Chichester, West Sussex, England.

Griffin, J.R., and W.B. Critchfield. 1972. The distribution of forest trees in California. USDA Forest Service Res. Paper PSW-82. Pacific Southwest Forest and Range Experimental Station, Berkeley, CA.

Harrison, R.L. 1997. A comparison of gray fox ecology between residential and undeveloped rural landscapes. J. Wildl. Management 61(1):112-122.

Hathaway, S., R. Fisher, C. Rochester, C. Haas, M. Mendelsohn, G. Turschak, D. Stokes, M. Madden-Smith, E. Ervin, K. Pease, and C. Brown. 2004. Baseline biodiversity survey for the Santa Ysabel Ranch Open Space Preserve. USGS Technical Report. Prepared for The Nature Conservancy and San Diego County Department of Parks and Recreation, Sacramento, CA. 120 pp.

Keeley, J.E., and C.J. Fotheringham. 2001. Historic fire regime in Southern California shrublands. Conservation Biology 15:1536-1548.

Klein, R.D. 1979. Urbanization and stream quality impairment. Water Resources Bulletin 15:948-963.

LaHaye, W.S., R.J. Gutiérrez, and H. Reşit Akçakaya. 1994. Spotted owl metapopulation dynamics in Southern California. Journal of Animal Ecology 63:775-785.

Langen, T.A., D.T. Bolger, and T.J. Case. 1991. Predation on artificial bird nests in chaparral fragments. Oecologia 86:395-401.

Lathrop, E.W., and C.D. Osborne. 1990. From acorn to tree: ecology of the Engelmann oak. Fremontia 19(3):30-35.

Leopold, L.B. 1994. A view of the river. Harvard University Press, Cambridge, MA.

Lindzey, F.G. 2003. Badger. Pages 683-691 *in* Feldhamer, G.A., B.C. Thompson, and J.A. Chapman (eds.), Wild mammals of North America, biology, management, and conservation. The John Hopkins University Press, Baltimore, MD. 1216 pp.

Maestas, J.D., R.L. Knight, and W.C. Gilgert. 2001. Biodiversity and land-use change in the American Mountain West. The Geographical Review 91(3):509-524.

Matlack, G.R. 1993. Sociological edge effects: spatial distribution of human impact in suburban forest fragments. Environmental Management 17(6):829-835.

McConnaughay, K.D.M., and F.A. Bazzaz. 1987. The relationship between gap size and performance of several colonizing annuals. Ecology 68(2):411-416.

McDonnell, M.J., and S.T.A. Pickett. 1990. The study of ecosystem structure and function along urban-rural gradients: an unexploited opportunity for ecology. Ecology 71:1231-1237.

McDonnell, M.J., S.T.A. Pickett, P. Groffman, P. Bohlen, R.V. Pouyat, W.C. Zipperer, R.W. Parmelee, M.M. Carreiro, and K. Medley. 1997. Ecosystem processes along an urban-to-rural gradient. Urban Ecosystems 1:21-36.

McGarigal, K and B.J. Marks. 1995. FRAGSTATS: spatial pattern analysis program for quantifying landscape structure. General Technical Report PNW-GTR-351. USDA Forest Service, Pacific Northwest Research Station, Portland, OR.

Medley, K.E., M.J. McDonnell, and S.T.A. Pickett. 1995. Forest-landscape structure along an urban-to-rural gradient. Professional Geographer 47(2):159-168.

Miles, S.R., and C.B. Goudey. 1997. Ecological subregions of California: section and subsection descriptions. USDA Forest Service, R5-EM-TP-005.

Miller, S.G., R.L. Knight, and C.K. Miller. 1998. Influence of recreational trails on breeding bird communities. Ecological Applications 8(1):162-169.

Minnich, R.A., and E. Franco Vizcaíno. 1998. Land of chamise and pines. Historical accounts and current status of northern Baja California's vegetation. University of California Press, Berkeley, CA. 166 pp.

Mittermeier, R.A., N. Myers, J.B. Thomsen, G.A.B. da Fonseca, and S. Olivieri. 1998. Biodiversity hotspots and major tropical wilderness areas: approaches to setting conservation priorities. Conservation Biology 12(3):516-520.

Mittermeier, R.A., N. Myers, P.R. Gil, and C.G. Mittermeier. 1999. Hotspots: earth's biologically richest and most endangered terrestrial ecoregions. Conservation International.

Montgomery, S.J. 2005. Results of 2004 field surveys for Stephens' kangaroo rats (*Dipodomys stephensi*) at Rancho Guejito, San Diego County, California. Prepared for Helix Environmental Planning. January.

Murcia, C. 1995. Edge effects in fragmented forests: implications for conservation. Trends in Ecology and Evolution 10:58-62.

Myers, N. 1997. Global biodiversity II: losses and threats. Chapter 5 *in* Meffe, G.K., and C.R. Carroll (eds.), Principles of conservation biology. 2nd ed. Sinauer Associates, Inc. Sunderland, MA.

Noon, B.R., and K.S. McKelvey. 1992. Stability properties of the spotted owl metapopulation in Southern California. Chapter 9 *In* Verner, J., K.S. McKelvey, B.R. Noon, R.J. Gutierrez, G.I. Gould Jr., and T.W. Beck (technical coordinators), The California spotted owl: a technical assessment of its current status. General Technical Report PSW-GTR-133. USDA Forest Service, Albany, CA.

Noss, R.F., and B. Csuti. 1997. Habitat fragmentation. Chapter 9 *in* Meffe, G.K., and C.R. Carroll (eds.), Principles of conservation biology. 2nd ed. Sinauer Associates, Inc. Sunderland, MA.

Noss, R.F., M.A. O'Connell, and D.D. Murphy. 1997. The science of conservation planning: habitat conservation under the Endangered Species Act. Island Press, Washington, DC.

Oberbauer, T.A., and J.M. Vanderwier. 1991. The vegetation and geologic substrate association and its effects on development in San Diego County. Pages 203-212 *in* Abbott, P.L., and W.J. Elliott (eds.), Environmental perils, San Diego Region. San Diego Association of Geologists, San Diego, CA.

Odell, E.A., and R.L. Knight. 2001. Songbird and medium-sized mammal communities associated with exurban development in Pitkin County, Colorado. Conservation Biology 15(4):1143-1150.

Ogden Environmental and Energy Services Co., Inc. 1998. Stephens' kangaroo rat study for the Ramona airport expansion project, Ramona, California. Prepared for KEA Environmental. January.

Pacific Southwest Biological Services, Inc. (PSBS), Kawasaki, Theilacker, Ueno and Associates, SJM Biological Consultants, and Brown-Berry Biological Consultants. 1993. San Diego County Water Authority emergency water storage project biological resource assessment. Reservoir sites. Vols. 1 and 2: Biological resource assessment and appendices. Prepared for Ogden Environmental and Energy Services and San Diego County Water Authority, San Diego, CA. September.

Paul, M.J., and J.L. Meyer. 2001. Streams in the urban landscape. Ann. Rev. Ecol. and Sys. 32:333-365.

Pavlik, B.M., P.C. Muick, S.G. Johnson, and M. Popper. 1991. Oaks of California. Cachuma Press and the California Oak Foundation, Oakland, CA. 184 pp.

Pickett, S.T.A., M.L. Casenasso, J.M. Grove, C.H. Nilon, R.V. Pouyat, W.C. Zipperer, and R. Costanza. 2001. Urban ecological systems: linking terrestrial ecological, physical, and socioeconomic components of metropolitan areas. Annual Review of Ecology and Systematics 32:127-157.

Poff, N.L., J.D. Allan, M.B. Bain, J.R. Karr, K.L. Prestegaard, B.D. Richter, R.E. Sparks, and J.C. Stromberg. 1997. The natural flow regime: a paradigm for river conservation and restoration. BioScience 47:769-784.

Riley, S.P.D., R.M. Sauvajot, T.K. Fuller, E.C. York, D.A. Kamradt, C. Bromley, and R.K. Wayne. 2003. Effects of urbanization and habitat fragmentation on bobcats and coyotes in Southern California. Conservation Biology 17:566-576.

Rottenborn, S.C. 1999. Predicting impacts of urbanization on riparian bird communities. Biological Conservation 88:289-299.

Santos, T. and J.L. Tellería. 1992. Edge effects on nest predation in Mediterranean fragmented forests. Biological Conservation 60:1-5.

Sargent, A.B., and D.W. Warner. 1972. Movements and denning habits of a badger. J. Mamm. 53:207-210.

Saunders, D.A., R.J. Hobbs, and C.R. Margules. 1991. Biological consequences of ecosystem fragmentation: a review. Conservation Biology 5:18-32.

Sauvajot, R.M. and M. Buechner. 1993. Effects of urban encroachment on wildlife in the Santa Monica Mountains. Pages 171-180 *in* Keeley, J.E., (ed.), Interface between ecology and land development in California. Los Angeles, CA: Southern California Academy of Sciences, Los Angeles, CA

Sauvajot, R.M., M. Buechner, D.A. Kamradt, and C.M. Schonewald. 1998. Patterns of human disturbance and response by small mammals and birds in chaparral near urban development. Urban Ecosystems 1998(2):279-297.

Scott, T.A. 1991. The distribution of Engelmann oak (*Quercus engelmannii*) in California. Pages 351-359 *in* USDA Forest Service General Technical Report, PSW-126.

Soulé, M.E., A.C. Alberts, and D.T. Bolger. 1992. The effects of habitat fragmentation on chaparral plants and vertebrates. Oikos 76:39-47.

Soulé, M.E., D.T. Bolger, A.C. Alberts, J. Wright, M. Sorice, and S. Hill. 1988. Reconstructed dynamics of rapid extinctions of chaparral-requiring birds in urban habitat islands. Conservation Biology 2:75-92.

Stallcup, J.A., M.D. White, N.L. Staus, and W.D. Spencer. 2005. Conservation significance of Rancho Guejito: the jewel of San Diego County. October. http://www.consbio.org/cbi/pubs/indexGuejito.htm.

Stein, B.A., L.S. Kutner, and J.S. Adams (eds.). 2000. Precious heritage: the status of biodiversity in the United States. Oxford University Press, New York, NY.

Stralberg, D., and B. Williams. 2002. Effects of residential development and landscape composition on the breeding birds of Placer County's foothill oak woodlands. USDA Forest Service Gen. Tech. Rep. PSW-GTR-184.

Suarez, A.V., D.T. Bolger, and T.J. Case. 1998. Effects of fragmentation and invasion on native ant communities in coastal southern California. Ecology 79(6):2,041-2,056.

Tigas, L.A., D.H. Van Vuren, and R.M. Sauvajot. 2002. Behavioral responses of bobcats and coyotes to habitat fragmentation and corridors in an urban environment. Biological Conservation 108:299-306.

Tyser, R.W. and C.A. Worley. 1992. Alien flora in grasslands adjacent to road and trail corridors in Glacier National Park, Montana (U.S.A.). Conservation Biology 6(2):253-262.

U.S. Fish and Wildlife Service (USFWS). 1997. Draft recovery plan for the Stephens' kangaroo rat. Region 1, Portland, OR. April.

Unitt, P. 2004. San Diego County bird atlas. Proceedings of the San Diego Society of Natural History No. 39. October. Ibis Publishing Company.

White, M.D., and K.A. Greer. 2006. The effects of watershed urbanization on the stream hydrology and riparian vegetation of Los Peñasquitos Creek, California. Landscape and Urban Planning 74(2):125-138.

Wilcove, D.S. 1985. Nest predation in forest tracts and the decline of migratory songbirds. Ecology 66:1,211-1,214.

Wilcove, D.S., C.H. McLellan, and A.P. Dobson. 1986. Habitat fragmentation in the temperate zone. Pages 237-256 *in* Soulé, M.E. (ed.), Conservation biology: the science of scarcity and diversity. Sinauer Associates, Sunderland, MA.

Wilcove, D.S., D. Rothstein, J. Subow, A. Philips, and E. Losos. 2000. Leading threats to biodiversity: What's imperiling U.S. species? Chapter 8 *in* Stein, B.A., L.S. Kutner, and J.S. Adams (eds.), Precious heritage: the status of biodiversity in the United States. Oxford University Press, New York, NY.

Wilcox, B.A., and D.D. Murphy. 1985. Conservation strategy: the effects of fragmentation on extinction. American Naturalist 125:879-887.

Woodroffe, R. and J.R. Ginsberg. 1998. Edge effects and the extinction of populations inside protected areas. Science 280(5372):2,126-2,128.

Appendix A
Methods for Analysis of Ecological Integrity

The ecological integrity of a landscape refers to the extent that it remains free of human modifications, which is an indication of the ability of ecosystems to function naturally. In our model, we used the distribution and extent of human land cover alteration from roads and urban and agricultural development to construct a simple cost surface over the county, which could be used to investigate ecological integrity across the landscape. Costs ranged from 0 to 5, with cost and ecological integrity inversely related. Costs were assigned in the following manner:

1. The 1:100,000-scale USGS roads dataset was buffered according to road class and assigned the following scores (0 = no cost, 5 = high cost):

Road class	Buffer	Cost
Class 1 (major highways)	30m (98 ft)	5
Class 2 (major roads)	20m (66 ft)	5
Class 3 (minor roads)	5m (16 ft)	3
Classes 4,5 (streets and trails)	2m (6 ft)	3

2. Land cover categories in the land cover dataset were assigned costs in the following manner:

Land cover type	Cost
Urban	5
Agriculture	3
Natural habitats	0

3. A grid with 5,000 ft^2 cells was placed over the region. Total area-weighted costs were calculated for each grid cell, and each cell was assigned a final score from 0 (high integrity) to 5 (low integrity). Integrity scores (Figure5) were divided into 5 classes:

Integrity	Cost range
Very high	0 - 0.10
High	0.11 – 0.5
Moderate	0.51 – 1.0
Low	1.01 – 2.5
Very low	2.51 – 5.0

Appendix B
Selected Sensitive, Rare, and Endangered Species Likely to Be Most Impacted by Increased Densities, based on Analysis of Vegetation Community Impacts

Scientific Name	Common Name	Regulatory Status[1]	Primary Habitats[2]
Plants			
Acanthomintha ilicifolia	San Diego thornmint	FT/SE/1B/MSCP	GRS, CHP, Scrub
Arctostaphylos rainbowensis	Rainbow manzanita	1B/MSCP	CHP
Astragalus oocarpus	San Diego milk-vetch	1B	CHP, OW
Baccharis vanessae	Encinitas baccharis	FT/SE/1B/MSCP	CHP
Brodiaea orcuttii	Orcutt's brodiaea	FSC/1B/MSCP	GRS, OW, VP
Clarkia delicata	Delicate clarkia	1B	GRS
Grindelia hirsutula var. *hallii*	San Diego gumplant	1B	CHP, OW
Horkelia truncata	Ramona horkelia	1B	CHP, OW
Machaeranthera juncea	Rush chaparral-star	4	CHP, Scrub
Monardella hypoleuca ssp. *lanata*	Felt-leaved monardella	1B	CHP, OW
Nolina cismontana	Chaparral beargrass	FSC/1B/MSCP	CHP, Scrub
Ophioglossum lusitanicum ssp. *californicu*	California adder's-tongue fern	4	CHP, GRS, VP
Pinus coulteri	Coulter pine	-	CON
Polygala cornuta ssp. *fishiae*	Fish's milkwort	4	CHP, OW RIP
Quercus engelmannii	Engelmann oak	MSCP	OW
Satureja chandleri	San Miguel savory	1B/MSCP	GRS, OW, RIP
Scutellaria bolanderi ssp. *austromontana*	Southern skullcap	1B	CHP, OW, CON
Senecio ganderi	Gander's butterweed	FSC/SR/1B/MSCP	CHP
Tetracoccus dioicus	Parry's tetracoccus	FSC/1B/MSCP	CHP
Invertebrates			
Euphyes vestris harbisoni	Harbison's dun skipper	FSC/MSCP	RIP, OW
Streptocephalus woottoni	Riverside fairy shrimp	FE	VP
Branchinecta sandiegonensis	San Diego fairy shrimp	FE/MSCP	VP
Fish, Reptiles, Amphibians			
Gila orcutti	Arroyo chub	SSC	RIP
Taricha torosa torosa	California newt	SSC/MSCP	RIP
Bufo californicus	Arroyo toad	FE/SSC/MSCP	RIP
Spea hammondii	Western spadefoot	FSC/SSC/MSCP	VP
Rana aurora draytonii	California red-legged frog	FT/SSC	RIP
Clemmys marmorata pallida	Southwestern pond turtle	FSC/SSC/MSCP	RIP
Phrynosoma coronatum blainvillei	San Diego horned lizard	FSC/SSC/MSCP	CHP, Scrub
Aspidoscelis hyperythrus	Orange-throated whiptail	FSC/SSC/MSCP	CHP, Scrub, GRS
Eumeces skiltonianus interparietalis	Coronado skink	SSC	Multi
Thamnophis hammondii	Two-striped garter snake	SSC	RIP
Crotalus ruber ruber	No. red diamond rattlesnake	SSC	Multi
Anniella pulchra pulchra	Silvery legless lizard	SSC	Multi
Salvadora hexalepis virgultea	Coast patchnose snake	SSC	Multi
Birds			
Haliaeetus leucocephalus	Bald eagle	FE/SE/SFP/MSCP	Multi
Aquila chrysaetos	Golden eagle	SSC/SFP/MSCP	Multi

Scientific Name	Common Name	Regulatory Status[1]	Primary Habitats[2]
Accipiter cooperii	Cooper's hawk	SSC/MSCP	OW
Circus cyaneus	Northern harrier	SSC/MSCP	GRS
Accipiter striatus	Sharp-shinned hawk	SSC	Multi
Buteo regalis	Ferruginous hawk	SSC	GRS
Athene cunicularia hypugaea	Burrowing owl	FSC/SSC/MSCP	GRS
Strix occidentalis occidentalis	California spotted owl	SSC	CON
Asio otus	Long-eared owl	SSC	Multi
Asio flammeus	Short-eared owl	CSC	GRS
Falco columbarius	Merlin	SSC	Multi
Falco mexicanus	Prairie falcon	SSC	Multi
Elanus axillaris	White-tailed kite	FSC/SSC	GRS
Polioptila californica californica	California gnatcatcher	FT/SSC/MSCP	Scrub
Campylorhynchus brunneicapillus couesi	Cactus wren	SSC/MSCP	Scrub
Aimophila ruficeps canescens	Rufous-crowned sparrow	FSC/SSC/MSCP	Scrub
Amphispiza belli belli	Bell's sage sparrow	SSC/MSCP	Scrub, GRS
Ammodramus savannarum perpallidus	Grasshopper sparrow	FSC/MSCP	GRS
Chondestes grammacus	Lark sparrow	FSC	GRS
Eremophila alpestris actia	California horned lark	SSC	GRS
Agelaius tricolor	Tricolored blackbird	FSC/SSC/MSCP	GRS, WT
Icteria virens	Yellow-breasted chat	SSC/MSCP	RIP
Dendroica petechia	Yellow warbler	SSC	RIP
Vireo bellii pusillus	Least Bell's vireo	FE/SE/MSCP	RIP
Empidonax trailii extimus	Southwest. willow flycatcher	FE/MSCP	RIP
Sialia mexicana	Western bluebird	MSCP	OW
Lanius ludovicianus	Loggerhead shrike	SSC	GRS, scrub
Mammals			
Eumops perotis californicus	California mastiff bat	SSC	Multi
Antrozous pallidus	Pallid bat	SSC	Multi
Plecotus townsendii	Townsend's big-eared bat	SSC	Multi
Taxidea taxus	American badger	SSC	GRS
Bassariscus astutus	Ringtail	SFP	Rocky outcrops
Lepus californicus bennettii	Black-tailed jackrabbit	FSC/SSC/MSCP	Multi
Chaetodipus californicus femoralis	California pocket mouse	SSC	Multi
Chaetodipus fallax fallax	San Diego pocket mouse	SSC	Multi
Neotoma lepida intermedia	San Diego desert woodrat	SSC	Multi
Dipodomys stephensi	Stephens' kangaroo rat	FE/ST/MSCP	GRS
Odocoileus hemionus fuliginata	Southern mule deer	MSCP	Multi
Felis concolor	Mountain lion	MSCP	Multi

[1] FE = federally listed as endangered.
FT = federally listed as threatened.
FSC = federal species of concern.
SE = state listed as endangered.
ST = state listed as threatened.
SR = state listed as rare.
SSC = state species of concern.
SFP = state fully protected.
1B = CNPS List 1B—rare or endangered in California and elsewhere (CNPS 2001).
4 = CNPS List 4—plants of limited distribution (CNPS 2001).
MSCP = sensitive species addressed by North County MSCP subarea plan.

[2] CHP = chaparral, CON = coniferous forest, GRS = grassland, RIP = Riparian, OW = oak woodland, WT = wetland, Multi = multiple habitats, VP = vernal pools

Source: records from CNDDB, Unitt 2004, Hathaway et al. 2004, PSBS et al. 1993, County predictive models.

LETTER 7: LEIGH FITZPATRICK, EXECUTIVE DIRECTOR. TRUCKEE TRAILS FOUNDATION.

Attachment 1

Class I

- **There is a completed Class I Trail along the east/north side of Brockway Road from the Truckee Regional Park to Estates Drive;**
- **The Recreational Trail from Olympic Heights to Downtown is complete from Olympic Heights to the 267 Bypass (actually about 200 yards beyond);**

Class II

- **The Donner Pass Road Class II Bike Lane is complete westwards to Mogul Way;**
- **The Northwoods Class II Bike Lane is complete;**
- **West River Street from the roundabout access road to Highway 89 South should be shown as a Proposed Class II Bike Lane instead of a Class III Bike Route per the recent Measure A Workshop for Town Council.**

Class III

- **All Class III Bike Routes should be shown as "completed".**

LETTER 8: ROBERT HIMSL. PONDEROSA GOLF COURSE.

Truckee Donner
Recreation and Park District

10046 Church Street, Truckee, California 96161
PHONE (530) 582-7720 FAX (530) 582-7724

General Manager
Steve Randall

October 18, 2004

Tony Lashbrook
Town of Truckee
Community Development Director
10183 Airport Road
Truckee, CA 96161

File #100426

Re: Ponderosa Golf Course

Dear Tony,

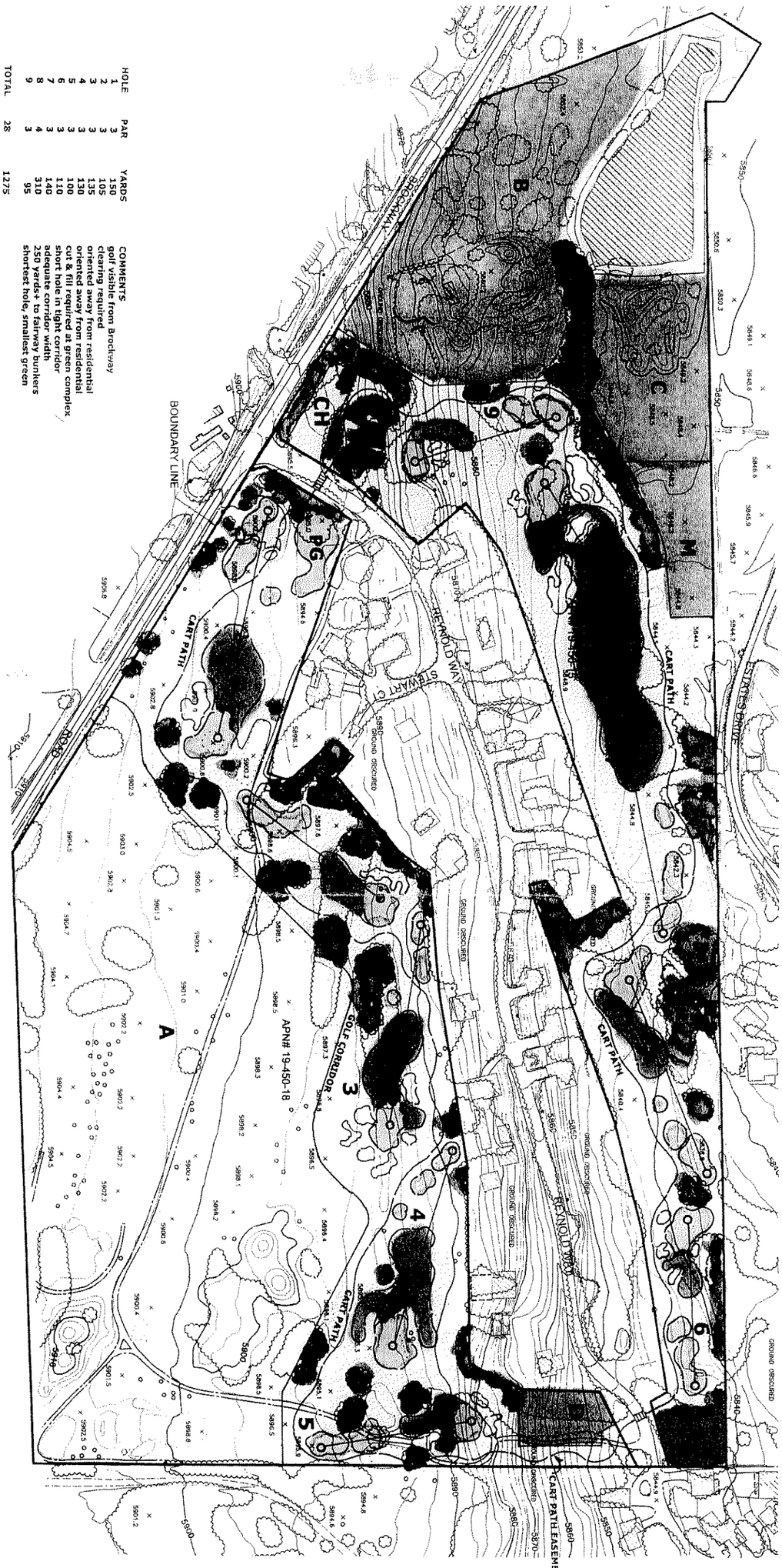
At the October 14, 2004 Truckee Donner Recreation & Park District Board of Directors meeting, the subject of the District having interest in owning and operating an executive par 3 golf course was discussed. The board approved the concept of getting into the golf course business if the developers of the Ponderosa Golf Course receive project approval from the Town of Truckee and ultimately give the course to the District.

This agreement to look at the potential of owning and operating a public golf course is not an endorsement of the Ponderosa Golf course project. It is simply an understanding that the District would be very interested in providing a public golf course for the community should it be financially feasible.

Should you have any questions on this issue, please give a call

Steve Randall
General Manager

Cc: Robert Himsl, Ponderosa Golf Course



HOLE	PAR	YARDS	COMMENTS
1	3	150	golf visible from Brockway
2	3	155	clearing required
3	3	135	oriented away from residential
4	3	130	oriented away from residential
5	3	100	multiple tiers at green complex
6	3	110	short hole in light corridor
7	3	140	adequate corridor width
8	4	310	250 yards+ to fairway bunkers
9	3	95	shortest hole, smallest green
TOTAL	28	1275	

A	15 AC development parcel
B	5 AC development parcel
C	2 AC development parcel
D	0.4 AC residential lot
E	0.3 AC residential lot
M	0.7 AC Maintenance Area

GRAPHIC SCALE
(IN FEET)
1 INCH = 100 FT.

S:\Job Projects\0407-PONDEROSA\dwg\0407 BASEMAP.dwg 6/18/2004 9:17:28 AM PDT

1 OF 1

GRASS VALLEY
530-272-5841
TRUCKEE
530 582-4043
FAX 530-272-5880

SCO PLANNING & ENGINEERING, INC.

PONDEROSA GOLF COURSE
TOPOGRAPHIC MAP

TOWN OF TRUCKEE — CALIFORNIA

NO.	REVISIONS	DATE

DESIGNED: MDW
DRAWN: DEC
PROJ. NO: 0407
DWG: SEE DAYSTAMP
DATE: SEE DAYSTAMP

Ponderosa Golf Course TRUCKEE
Robert Hinsl
PGC Partnership
P.O. Box 332
Sunol, CA 94586
tel: 925-484-5222
rhinsl@comcast.net

COLLIERS INTERNATIONAL
John Steinbuch, SIOR

WARD YOUNG ARCHITECTURE & PLANNING
KEVIN BACON

Tom Johnson Golf Design
6296 Hansen Dr.
Suite 206
Pleasanton CA 94566
Tel 925.462.6243
Fax 925.484.9335
tjohnson@tsjgolf.com
www.tsjgolf.com

Plan C	7/04	