The Benefits and Costs of the Lindsay Creek Project Watershed and Community Based Land Use Assessment: An Evaluation

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Abstract

A methodology for evaluating the "Lindsay Creek Watershed and Community-based Land Use Assessment Approach" is outlined and discussed. The" Lindsay Creek Watershed Based Approach is defined as a set of steps and activities over and above the traditional or conventional land use planning process. In particular the additional costs of the Lindsay Creek Watershed Based Approach are considered and ranges of costs estimated. Several types of market benefits are discussed: benefits regarding property values, benefits from clustering versus unfocused development, benefits related to stormwater management as well as non-market benefits regarding habitat, environmental amenities and human health. These benefits in large part are discussed in reference to cases cited in the Center for Watershed Protection article ""Economics of Watershed Protection". The questions to be asked when evaluating any use of the Lindsay Creek Watershed Based approach are listed and are answered for purposes of illustration in reference to the Lindsay Creek Watershed Project. A dissemination and follow-up program is proposed and a public and privately funded grant program supporting use of the Lindsay Creek watershed approach is suggested.

1.0 Background:

In 2003 the Natural Resources Services (NRS) Division of Redwood Community Action Agency (RCAA, 2003), Eureka, California, was granted funds from the State Water Resources Control board (SWRCD) for "The Lindsay Creek Project: Watershed & Community Based Land Use Assessment." Lindsay Creek Watershed is located in Humboldt County in northwest California (see Box: Background). It covers approximately 11,500 acres and supports one of the few remaining wild populations of endangered coho and chinook salmon (RCAA, 2005a). Results of the Lindsay Creek Project are described in A *Strategy for the Lindsay Creek Watershed & Community* (RCAA, *Strategy* 2005a). Tools intended for land use planners, elected officials, state and national officials and interested community members are described in *Start with the Watershed: A Handbook for Rural Watershed & Community Based Land Use Planning* (RCAA *Handbook*, 2005b). In contrast to the *Strategy* and *Handbook*, this report is *an analysis of the benefits and costs* of the Watershed and Community Based Land Use Approach derived from the Lindsay Creek Project.

Watershed Background

The Lindsay Creek watershed is located two miles east of the community of McKinleyville and six miles north of the City of Arcata on the north coast of California. A tributary of the Mad River, Lindsay Creek supports one of California's few remaining wild populations of endangered coho and chinook salmon. Lindsay Creek is considered by fisheries biologists to be one of the most productive streams for coho in the Mad River watershed. Lindsay Creek has five major tributaries: Squaw Creek, Grassy Creek, Anker Creek, Mather Creek, and an unnamed tributary in the western watershed.

The Lindsay Creek watershed is approximately 11,150 acres in size (see map) and includes a distinctive mix of working timber and agricultural lands, the greater rural residential Fieldbrook community (and some of the Glendale community), and natural habitats.

The community of Fieldbrook, located completely within the watershed, is characterized by a relatively compact (at least in a rural sense) 'downtown' residential area – including a general store, a grange hall and an elementary school – and a dispersed area of residential properties on larger acreages. Also within the lower watershed are a small northerly portion of the more densely inhabited community of Glendale and portions of parcels in the 'Essex' area. A compilation of the several area Volunteer Fire Departments' records suggest just over 600 households in the watershed.

Fieldbrook Road/Murray Road is the only public road in the watershed, other than a small portion of State Route 299 at the confluence of Lindsay Creek and Mad River. The Fieldbrook Community Services District serves Glendale, residents along Fieldbrook Road and residents of the 'town center' area with water service and the residents of Glendale and lower Fieldbrook road with wastewater service. Residents of the watershed are served by three Volunteer Fire Districts (Fieldbrook, Arcata and Blue Lake); three School Districts (Fieldbrook, Blue Lake and McKinleyville); and also span several postal codes and phone prefixes, resulting in what some feel is a 'community identity frustration'.

The Fieldbrook community and greater watershed area have experienced a moderate rate of rural residential growth and land use change in the past 25 years. The future will bring more growth, changes in land use and zoning, and natural disturbances such as flooding and fire. The current update of the Humboldt County General Plan (GPU) allows for the possibility of changing existing land use and densities in portions of the watershed. How Lindsay Creek's natural resource values and the community's quality of life are affected will rely in part on the quality of information available to guide future land use management and stewardship.

2.0 Summary of Evaluation Methodology

There are different evaluations relevant to the Lindsay Creek Watershed and Community Based Land Use Assessment Project:

- evaluation of the Lindsay Creek Project specifically in terms of its particular assessment of and recommendations for Lindsay Creek
- evaluation of the Lindsay Creek Project in terms of its development of an approach to be used by other watersheds
- evaluation of the Watershed Handbook as a tool and
- evaluation of the application of the Lindsay Creek Watershed Approach by other communities.

The methodology used in this report is based on an analysis of costs and benefits of the Lindsay Creek Watershed Approach and is applicable to the above types of evaluations.

Basically the Lindsay Creek Watershed Approach is defined by the costs it incurs over and above what would be done otherwise, in a typical non-watershed based process. The benefits are divided into market and non-market type benefits associated with four types of watershed related tools:

- Protection (especially of large parcels)
- Buffers
- Clustering (conservation subdivisions, rural clustering, focused growth and density bonuses)
- Watershed Stewardship

Following an overview discussion of costs and benefits, types of benefits are discussed in reference to cases cited in the Center for Watershed Protection article "Economics of Watershed Protection" (CWP, 2000). Another section lists questions to be addressed in an evaluation of the Lindsay Creek Watershed Approach and answers these questions specifically for the Lindsay Creek watershed.

3.0 Definitions:

3.1 Traditional Planning and a Watershed Based Planning Approach:

The Lindsay Creek Watershed *Strategy* considers traditional land use planning

> …to be the legally mandated process by which cities and counties develop land use plans based on geo-political boundaries; gathering legally-required public input; and compiling "baseline" ecological data and conducting only the most basic assessment of ecological impacts—concentrated toward the end of the planning process—as legally required by state or federal environmental regulations (*Strategy* pp. 6-7).

In contrast the proposed Lindsay Creek Watershed-based planning process

differs in terms of emphasis and focus—gathering an increased level of resource data, assessing impacts early in the process, sharing results with the public throughout the process, then soliciting informed public input, and using both input and resource assessment results in formulation of the plan and policies (*ibid.* pp. 6-7).

3.2 Lindsay Creek Watershed Based Approach Steps, Activities and Recommendations

Specifically the "Lindsay Creek Watershed and Community-Approach includes the following: seven steps:

1. Commitment to the Approach
2. Scope the issues
3. Gather Resource and Social Data
4. Analyze and Assess Data
5. Integrate Results and Develop Recommendations
6. Implement Recommendations and
7. Evaluate Results

These Steps are described in detail in *The Strategy* and in *The Watershed Handbook*, (pp. 6 – 9).

Steps 2 – 5 involve activities in 3 Activity Areas:

1. Public participation
2. Watershed assessment
3. Land use research

These three areas and their relationship to steps two through five are depicted in Figure 2 p. 7 of *The Strategy*.

The above characterizes the "activities" that comprise the Watershed Assessment Approach. Some of these activities can be incorporated into existing processes, for example an already scheduled community plan could be reformulated as a Lindsay Watershed Assessment. Also a General Plan process could more thoroughly integrate ecological impacts into and throughout the process, instead of a more cursory baseline inventory of natural resources as background to the General Plan. Such an integration of ecological impacts into the planning process would tend to increase the likelihood of ecological impacts being more fully represented in policies and outcomes of the General Plan.

Specifically the Lindsay Creek Project, developed recommendations in 6 "Priority Management Goals and Recommendations" areas:

1. Conserving Salmonid Habitat Quality
2. Conserving Riparian Habitat Quality
3. Conserving Large Parcels
4. Reducing Risks of Road-related Sediment
5. Reducing Risk of Septic Pollution

6. Reducing Risk of Slope Instability

Each of these six Priority Recommendations categories are directed at three different levels:

1. Community Action Recommendations
2. Local Government Recommendations
3. State and Federal Recommendations (DFG. CDF etc.)

4.0 Costs

For the purposes of this evaluation, the "costs" of the Lindsay Creek Watershed Based Approach are the costs for conducting the Seven Steps in a manner and at a cost *over and above* the expenditures that would typically be made in developing a General Plan. Similarly watershed based costs would be those costs *over and above* what would be incurred in such a typical community plan. If a community group were to attempt a Lindsay Creek Watershed Based Approach independently and separately from a General Plan or Community plan process, then all the costs involved would be considered as the cost of the process. In other words, in the case of an independently conducted watershed based assessment, all the activities and costs could be considered as over and above what would have been done and expended otherwise.

The following illustrates costs of the Lindsay Creek approach in more detail.

First, consider coordinating the "Commitment to Approach" step. If the watershed based approach were carried out by a County, it could involve some combination of additional paid time or in-kind or volunteer contributions of time. This additional time would include that of watershed assessment professionals (as staff or as consultants). Also this step would include the costs of any facilities used for meetings, the cost of mailings etc. The cash costs could range considerably, depending on the amount of paid versus volunteered or in-kind time contributed. The distinction is that any of these efforts would be above and beyond what would typically be involved in the General Plan or community plan process. If the approach were carried out independently of a General Plan or Community plan, then all of the time and cost of notification and conducting a public meeting etc. could be considered as additional to what would have been done otherwise.

Each step 2 through 4 encompasses three different activity areas. For example Step 2: Scoping Issues has activities related to public participation, watershed assessment, and land use research and similarly for Step 3, Gather Resource and Social Data and Step 4, Analyze and Assess Data. In the case of the Scoping Step, public participation involved "open-ended interviews" with 20 resident stakeholders and nine additional interviews with non-residents of Lindsay Creek including representatives of County planning, other planning professional, and others. Other examples of Scoping activities are listed in Figure 2 p. 7 of *The Strategy*. Again, all these activities would be activities typically conducted in a General Plan or community plan process.

5.0 Overview of Types of Benefits

The Center for Watershed Protection article ""Economics of Watershed Protection" (CWP 2000) has an extensive compilation of cases analyzing the benefits of Watershed Protection. It summarizes these cases in terms of what it calls "tools for Watershed Protection." These "tools" are given in two alternate, but largely corresponding, listings in their article. (Each tool in the first column matches with its corresponding tool in the second column, except #4 Better Site Design in the first column relates to tools #4 and #5 in the second column).

8 "tools" for Watershed Protection (Fig. 1 p. 161) and 9 "tools" (Table 3 p. 16) (CWP, 2000)

1. Land Use Planning	**1. Watershed Planning and Zoning**
2. Land Conservation	**2. Protect Sensitive Areas**
3. Aquatic Buffers	**3. Establish Buffer Network**
4. Better Site Design	**4. Cluster and Open Space Development**
	5. Narrow Streets and Smaller Parking Lots
5. Erosion and Sediment Control	**6. Erosion and Sediment Control**
6. Stormwater and Drainage Practices	**7. Stormwater Best Mgt. Practices**
7. Non-stormwater Systems	**8. Treat Septic System Effluent**
8. Watershed Stewardship Program	**9. Ongoing Watershed Management**

In this author's review of the "tools" in the "Economics" article, it became clear that, rather than being exclusively "tools," these categories are a combination of types of tools *and* categories of benefits. The actual watershed tools could be better described as:

- Protection (especially of large parcels)
- Buffers
- Clustering (conservation subdivisions, rural clustering, focused growth and density bonuses)
- Watershed Stewardship

Benefits can be categorized as market benefits and "non-market" benefits. Market benefits include those benefits normally associated with market prices and operating costs as impacts on the overall economy such as: Increases in land Value/Land Price (lower operation costs to owners) reductions in development related cost, reduction in storm water costs, improvement of the local economy

Some seemingly non-market benefits can be quantified, for example environmental amenities such as a view of a wooded hillside has been estimated in terms of increased property values using what economists call "hedonic regression" methods (Hackett, 2004). Some environmental benefits involve use, such as increased opportunities for viewing birds. Other benefits are non-use or intrinsic values, such as knowing a species has not become extinct or continues to exist in a locale. As economist Ernie Niemi puts it "One doesn't have to catch salmon to value them"(CEED 2002).

Other watershed benefits include:

- Improvements of habitat (terrestrial and aquatic) and benefits for plants and animals
- Improvements in environmental amenities
- Improvements in human health, such as benefits from improved recreational opportunities such as footpaths.

The above types of benefits are discussed in Section 3.

Also six types of Recommendations are made in the Lindsay Creek *Strategy*.

For the purposes of this report, the recommendations can be thought of as falling into the four different categories listed previously

1. Protection of large parcels
2. Buffer or conservation easement-related
3. Clustering (conservation subdivision, rural clustering, focused growth and density bonuses)
4. Watershed Stewardship

and also recommendations for:

5. Additional or improved data collection or analysis
6. Improvements in institutional functioning or coordination

The Lindsay Creek Watershed Based Approach can also be thought of as proceeding in phases. The recently completed Lindsay Creek Project, as a whole, can be thought of as an initial phase, which sets the stage for further work. Recommendations of this phase include the "next steps" of the process. A final phase of the Lindsay Creek Watershed Based Approach would be one that culminates in the actual adoption or implementation of specific policies and measures.

Conceptually there are two ways of evaluating the benefits and costs of the Lindsay Creek Watershed Based Approach. One type of evaluation would consider the initial Phase One results. The process itself of developing recommendations may well increase the probability that a package of watershed recommendations is eventually adopted.

Another form of evaluation would be a "post-evaluation." This would take the benefits of the package of watershed recommendations that were actually adopted, above and beyond, what would have been adopted without using the Lindsay Creek Watershed Based Approach. To determine net benefits costs would be subracted. In this case, there is no "increased probability" of adopting a package of watershed measures, only the measures actually adopted and the net benefits from those measures.

6.0 Examples and Discussion of Benefits of the Lindsay Creek Watershed Based Approach

The Center for Watershed Protection article ""Economics of Watershed Protection" cites many examples of benefits from watershed protection measures. The following ***in bold*** mentions

some of these benefits followed *in italics* by my comments in relation to the Lindsay Creek Watershed Based Approach.

6.1 Increases in Property Values

-- "Homes situated near seven California stream restoration projects had a three to 13% higher property value than similar homes located on unrestored streams (Streiner and Loomis, 1996)."

This case suggests a "pure" improvement in value, due to stream restoration. However, other changes in property values related to watershed protection, are not so simple and straightforward. In practice benefits can be very difficult to evaluate. Consider a particular parcel: a base line use needs to be established for that parcel and any land use decisions that affect this base line use would need to be determined. The benefits and costs of these impacts on that property owner would then be evaluated. For example, increased buffers might reduce the number of housing units that could be built on a parcel and could in so far as buffers do this, they could tend to lower the sale price of that parcel.

There could be positive impacts on adjacent landowners. For example, in Colorado "housing prices were found to be 32% higher, if they were located next to a greenbelt buffer (Correll et al). Also owners of other, non adjacent, parcels might be affected, for example their property values might rise due to an increase in prices paid for developable land which in turn could have been the result of a reduction in the supply of such land.

On the other hand, for a prospective homebuyer (or renter), increases in property values would tend to increase their cost of housing. So "gains" for property owners, could be thought of, at least in part, as "losses" for buyers and renters. It is important to recognize thatcConcern for watersheds exists within a context that includes demand and supply needs and pressures for housing.

-- One case of land use regulation in Maryland and New Jersey (Beaton 1988) indicated that "the value of developed land within the regulated area had climbed five to 17%, and the value of vacant land had increased by five or 25%…Since both developed and undeveloped land had grown in value, owners received a significant premium when they sold their property."

One question that arises is "would the sale value of both developed and undeveloped land similarly increase in Lindsay Creek watershed or in other communities who might use The Watershed Handbook, if such watershed based planning regulations were imposed?" The suggestion from this one study is that they could. It is not clear, though, how property values would have changed had there not been regulation.

-- Conserving forests on residential and commercial sites can increase property values by six to 15% and increases the rate which units are sold or leased (Morales, 1980, Weyerhauser, 1989).

It is not clear whether these increases are on the residential and commercial sites on which forests are conserved or on adjacent or other land.

-- [I]n 32 out of 39 communities, buffers were thought of as having a positive or neutral impact on adjacent property values (Schueler, 1995).

This suggests that there is some basis to believe that residents and owners in Lindsay Creek and other watersheds could not regard buffers negatively

-- " …'greenway,' stream buffers can expand recreations opportunities and increase the value of adjacent parcels (Flink and Searns, 1993)….Pennypack Park in Philadelphia is credited with a 33% increase in the value of nearby property. A net increase of more than $3.3 million in real estate value is attributed to the park (Chesapeake Bay foundation. 1996a).

Although Lindsay Creek has no prospect of such a major recreational park development, other watersheds might and this benefit could be significant. A net increase of more than ($3.81 million in 2004 dollars) in real estate value is attributed to the Pennypack Park (Chesapeake Bay Foundation, 1996a). A greenway in Boulder, Colorado was found to have increased aggregate property value by $5.4 million, resulting in $500,000 of additional tax revenue per year (Chesapeake Bay Foundation 1996a) **$***570,750 in 2004 dollars.*

-- An EPA reported (1995) of twenty real estate studies that found "developers could charge a per lot premium of up to ($11,779) for homes situated near well-designed stormwater ponds and wetlands" ($13,704 in 2004 dollars). Also the "*Economics*" article notes that the view of stormwater wetlands increased the sale price of homes in Minnesota by one-third compared to homes without any "waterfront" influence (Clean Water Partnership, 1996).

-- Cluster development [which will be discussed in the next section] in Massachusetts were found to appreciate 12% faster than conventional subdivisions over a 20-year period (Lacey and Arendt, 1990).

This example, suggestions that there might be values associated with cluster development that increase property values separate from increases due to housing demand and supply pressures.

6.2 Decreased Costs for Residents/Businesses

-- "Conserving trees also saves money on energy bills and treatment of runoff…Studies indicate that retaining trees can save 20 to 25% in homes and business energy bills for heating and cooling" (CWP, 2000).

Because of Lindsay Creek's exceptionally mild weather such significant heating and cooling savings are unlikely. However, such benefits could be very significant in other watersheds.

-- "Corporate land owners can save between $270 to $640 per acre in annual mowing and maintenance costs when open lands are managed as a natural buffer area rather than Turf (Wildlife Habitat Enchancement Council, 1992).

In 2004 dollars these amounts would be **$339** *to* **$804** annually. *Although in Lindsay Creek there are no corporate land owners who maintain turf that could be managed as a natural buffer, other watersheds have such owners and could experience the indicated savings. In addition private residences that switch from maintaining turf to a natural buffer would experience a reduction in maintenance hours and supplies costs for which a dollar value could be calculated.*

-- Not included in the CWP "Economics" article are citations and cases related to fire dangers and risks. Fire related costs include costs associated with insurance and constructing, improving or maintaining roads to fire district standards as well as the possible increased erosion impacts because of such roads. Limiting new housing to existing developed areas would tend to reduce these costs. It is unfortunately beyond the scope of this report to examine further the significant costs and benefits involved in this increasingly important area of concern.

6.3 Reductions in Development Related Costs

The CWP "Economics" article cites cases involving what it refers to as "better site design". In particular it notes that cluster development:

-- Can reduce the capital cost of subdivision development by 10 to 33%, primarily by reducing the length of the infrastructure needed to serve the development (NaHB, 1986; Maryland Office of Planning, 1989, Schueler, 1996).

The "Economics" article compares the potential savings associated with an example, the Remlik Hall Farm example, developed by LandEthics Inc, for the Chesapeake Bay Foundation (1996b). This compares a conventional scenario involving 84 large-lot units to an "open-space scenario" of 52 units on smaller lots in three clusters.

Road construction costs are significantly lower for the Cluster Plan, $487,500 compared to the conventional plan $1,012,500 or $556,481 and $1,141,500 respectively in 2004 dollars. Even when adjusting for the number of units, the Cluster Plan road cost is $9,375 per unit, compared to the Conventional Plans road cost of $12,053 or $10,702 and $13,589 respectively in 2004 dollars or almost 30% higher per unit.

The conventional Plan involved a total of 287.41 acres or 3.42 acres per unit, while the Cluster Plan involved 60.41 total developed acres or 1.3 acres per unit. Significant other differences existed in total Undeveloped Land, forested land, wetlands, total impervious cover, and Total Nitrogen and Phosphorous use per year.

As dramatic as this example is, it is somewhat limited by its comparing scenarios with different numbers of housing units. A somewhat more relevant comparison would be between a

"conventional development scenario" and a "cluster development scenario" involving the same number of housing units. To do this we next consider some statistics regarding Humboldt County where Lindsay Creek Watershed is located.

Between 2005 and 2025, Humboldt County needs to build 3,354 housing units to meet the state projected growth rate of 0.5% per year (Smith and Steinberg, 2005). The housing densities in Humboldt County from 1985 – 2000 were approximately 1 housing unit per 10 acres. Smith and Steinberg estimate that only "166 or 5 per cent of the projected housing need could be built at these historical density levels. However, "an average density of 5 units would accommodate 8,273 units", an amount very much in excess of the 3,354 units needed.

Using the above statistics, for purposes of illustration, scenarios are constructed for a stylized Lindsay Creek watershed and for another watershed in Humboldt County that contains an existing sewer and water district-serviced area.

Lindsay Creek contains roughly 1% of the population of Humboldt County. On a directly proportional basis this implies 34 new housing units out of the 3,345 new housing units needed to meet projected growth County-wide. Suppose that the second watershed under consideration also has 1% of the population of the County and its share of new housing is also 34 units.

Scenario 1: Involves continuing historical densities in each watershed, i.e. 10 acres per unit or 340 acres for 34 new houses developed in each watershed, or 680 acres total for new housing..

Scenario 2: Involves an average new housing density of 5 units per acre in each watershed or approximately 7 acres in each watershed. In the absence of a community sewer system, this scenario is not possible in because the minimum acreage for septic tanks, where permitted, ranges from 1 and 2 1/2 acres in Fieldbrook (RCAA, Strategy 2005a).

Scenario 3: Involves an average new housing densities of 1.7 acres per unit in Lindsay Creek or approximately 58 acres for new housing in Lindsay Creek. If there is an average density of 5 units per acre in the other watershed, approximately 7 acres would be needed for new housing in the second watershed. And a total of 65 acres developed for new housing.

Scenario 4: Involves a smaller total number of units built in Lindsay Creek watershed, at an average density of 1.7 acres per unit, say 10 units on 17 acres in Lindsay Creek watershed (this could be approximately 5 units on 2 1/2 acre parcels and 5 units on 1 acre parcels) and 58 units in the other watershed served by a community sewer system at a density of 5 units per acre, or approximately 12 acres for new housing. The acreage needed for new housing development then would be a total 29 acres for both watersheds.

Scenario 5: Construction of a new sewer system somewhere in the Lindsay Creek watershed, serving either the new 34 units, or the entire central Fieldbrook community or some number of units within this range.

One of the recommendations in the Lindsay Creek Strategy is to implement neighborhood of Septic Tank Effluent Pump (STEP) septic systems. Doing so could enable this scenario, but

would require lease or acquisition of an off-site septic leachfield to accommodate the whole development's septic tank effluent and the construction of the piping needed to connect and transport effluent. In STEP systems solids are pumped out by a septic tank pumper truck and transported to a wastewater treatment facility.

Since Scenario 2 is not possible, we are looking at four cases:

Scenario One, "Historical Sprawl", Scenario Three, "Unfocused Growth"; Scenario Four, "Clustered Growth", and Scenario 5: "New Sewer System."

In terms of total developed acres, the range is between 680 acres for the Historic Sprawl Scenario versus 29 acres for the Clustered Growth Scenario. The impact on road construction costs could be even more dramatic than in the Remlik case. If 34 new houses on 10 acres each were scattered throughout the Lindsay Creek watershed, they could involve several miles of new road for each unit. If 10 units were located in the Central Fieldbrook area, conceivably no new roads might be needed. No or fewer roads would require no or less increase in road maintenance, repair and replacement costs; such costs are mostly borne public agencies. With no or fewer miles of new roads, there would be less or no increases in erosion and concomitantly less degradation of water quality and aquatic habitat. Similarly there would be less fragmentation of terrestrial habitat and less disturbance and degradation of terrestrial habitat. Finally, both risks of forest fires affecting homes and human lives and the costs for fighting fires would be reduced in the clustered growth Scenario compared to the Historic Sprawl or Unfocused Growth Scenarios.

The net overall effects on property values and the property tax base are difficult to evaluate. If each of the needed housing units were on large parcels, the total property values involved would be highest. However, land does not appear available for developing all needed housing units on large parcels. The total value of property for housing with greater densities may be lower that the total property value for the same number of housing units located on larger parcels. Although, this could be considered a loss for property owners as a group selling parcels, individual property owners of lots that can be more densely developed could sell at higher prices than otherwise. Finally, lower property values translate into lower housing costs for residents and so make housing more affordable. A new study of housing markets (Glaeser, Saks, Gyourko, 2005) suggests that regulations reducing the supply of land for housing have increased housing prices. Clustering could reduce or somewhat reverse this effect.

6.4 Stormwater-Related Benefits

Another category of benefit is reduction of stormwater management costs and reduction in stormwater-related damages and risks.

-- The CWP "*Economics*" article notes that "the cost of treating the quality and quantity of stormwater runoff ranges from $2,000 to $50,000 per impervious acre" (CWP, 2000) or $2,145 to $53,620 respectively in 2004 dollars. It notes that better site design, such as clustered design, "can reduce site impervious cover from 10 to 50%. In the Remlik example, impervious cover was reduced from 15 5 acres (5.4% of 287 acres) in the

Conventional Scenario to 2.5 acres (3.7% of 69 acres) in the Cluster Plan, a reduction of 13 acres.

"When buffers contain the entire 100-year flood plain, they are an extremely cost-effective form of flood damage avoidance for both communities and individual property owners.

Presumably without such buffers some change in vegetative cover could occur which would increase the likelihood of flooding. Buffers, then, would be more effective (for their relatively negligible direct cost) compared to other flood control methods, such as constructing storm sewers, drainage ditches or channels, dikes, berms, etc.

-- *"Economics"* also notes that "…buffers can sharply reduce the number of drainage complaints received by local public works departments and they are often an effective means to mitigate or even prevent shoreline erosion."

This suggests that complaints in Lindsay Creek Watershed to Humboldt County Public Works and Fieldbrook CSD related to drainage would be lessened if increased buffers in Lindsay Creek were created. A benefit would be reduction in staff hours and equipment use related to avoided drainage complaints and problems and in less disruption of traffic patterns and reduced property damage.

-- *"Economics"* notes that "grassed swales and biorention areas…are less expensive to construct than enclosed drain systems and provide better environmental results (Liptan and Kinsella-Brown, 1996). The article also notes that maintenance costs for stormwater practices can equal the initial construction cost over a 20 to 25 year period. Provision needs to be made for funds to cover such maintenance costs.

Elsewhere in Humboldt County, such as in the community of McKinleyville, maintenance costs of subdivision related bioretention swales is passed on to homeowners through fees charged to homeowners associations.

6.5 Indirect Economic Benefits

In addition to benefits that accrue to individual property owners in terms of higher property values, or to government in terms of lower infrastructure related costs, watershed protection can benefit local economies.

-- *"Economics"* notes that a National Park Service survey of chief executive officers revealed that "quality of life" was ranked as the third most important factor in locating a new business" (National Park 1992).

In so far as watershed based considerations might maintain or improve the quality of life in Lindsay Creek watershed, it might influence a new business relocating in the area in Lindsay Creek or elsewhere in the County. For example, consider a new business investigating locating in the City of Blue Lake, which is up the Mad River from Lindsay Creek. Such a business could find a Lindsay Creek watershed developed according to a watershed-based approach with

stream buffers, protected forests etc. a more appealing setting for some of their employees than a watershed developed in ways that did not take into account watershed-related issues. If this increased the likelihood of a new business locating in Blue Lake, this would directly benefit the Blue Lake economy and thereby Humboldt County's economy and indirectly the economy of Lindsay Creek.

-- "Coastal wetland areas contribute to the local economy through recreation, fishing and flood protection"

A primary objective of watershed protection in Lindsay Creek Watershed is improvement of its salmonid populations. Lindsay Creek Watershed "supports one of California's few remaining wild populations of endangered coho and Chinook salmon. Lindsay Creek is considered to be one of the most productive streams for coho in the Mad River watershed (Strategy Appendix B2). EcoNorthwest (CEED, 2002) estimated the commercial value of Chinook from North of the Eel River as between $5 and $70 per fish.

A very important but little recognized and appreciated benefit is described in the following passages dealing with Eel River salmonids (CEED 2004) is also very relevant to salmonid populations in Lindsay Creek.

> … [F]ishery-based economic benefits can arise directly and indirectly. It is obvious that when the population of a species of fish that can be harvested increases, both sport and commercial fishing economies directly benefit from increases in harvestable fish. However, there is a not-so-obvious indirect beneficial effect as well. Because both strong and weak fish populations intermingle in the ocean, to protect some depressed or weak salmon runs, restrictions have been placed on harvesting of runs that are otherwise plentiful (such as the California Central Valley hatchery-origin stock, which migrate north throughout Northern California in the millions), in order to reduce the chances of accidental over-fishing on the weakest populations in these intermingling fisheries. This is referred to as "weak stock management," by which the weakest stock becomes the limiting factor in all intermingling fisheries, and is a conservation requirement of the Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. 1801 *et seq.*). **Thus to save one very weak stock (and federally protected)…[such as] coho might mean forgoing harvests on hundreds of otherwise abundant (hatchery-origin) chinook** [emphasis added]**.**
>
> Even small increases in very weak-population species, such as coho salmon, could indirectly benefit sport and commercial fishing on chinook if they caused a relaxing of restrictions on the harvesting of some of these far more plentiful species, such as Central Valley hatchery-origin chinook. **Thus small increases in … salmonid populations could have large economic benefits to the commercial fishing industry and sport fishing business both directly and indirectly, potentially allowing harvest access to many more fish from these otherwise abundant stocks that are now off limits. These benefits would specifically include additional fishing opportunities (and thus additional fishing income and jobs) to coastal fishing towns…** [emphasis added.] . (Glen Spain, 2004, Institute for Fisheries Resources. Personal communication.) (CEED, 2004).

6.6 Non-Market, Intrinsic-related and Public Trust Benefits

"Economics" cites several cases documenting the improvement in wildlife habitat (terrestrial and aquatic).

-- Schueler found that "each mile of buffer protects 12 acres of habitat along shorelines and 25 acres along creeks" (Schueler, 1995).

This implies a buffer of 100 feet on each side of a creek. For a given package of recommendations or for an actually adopted and implemented set of measures, the number of miles of 100 foot stream buffers could be multiple by 12 acres to obtain the total number of acres of habitat directly protected.

If a watershed based approach resulted in buffers with larger or smaller width than would otherwise be required, the benefits and costs of such changes should be evaluated for the resulting number of miles of affected buffers.

-- "A continuous buffer provides a wildlife corridor which is of particular value in protecting amphibians and waterfowl populations, as well as coastal fish spawning and nursery area" Adams (1994) is cited as reporting that "60% of suburb and residents actively engage in wildlife watching near their homes, and a majority are willing to pay a premium for homes located in a setting that attracts wildlife."

A package of recommendations or of actually adopted and implemented set of measures, could be evaluated for the extent that they create such continuous buffers providing wildlife corridors.

Corridors could also decrease the likelihood of specific species becoming extinct in a watershed. As noted previously, economist Ernie Niemi of EcoNorthwest puts it "People don't have to catch salmon to value them" (CEED, 2002). He adds "One carefully conducted survey of residents of Washington and Oregon found that they place a substantial value on restoring and maintaining healthy salmon populations, saying that on average they are willing to pay about $30 – $97 per household, per year to protect salmon (Niemi et al 1999)…Perhaps [Californian's] willingness to pay for actions to protect salmon is at the low end of what was found in Washington and Oregon -- $30 per household per year. If so, then multiplying this amount times the 5 million household in northern California, indicates that the total intrinsic value residents of the region place on protecting and rebuilding salmon populations is about $150 million per year." (CEED, 2002).

-- "Economics" cites a North Carolina survey (Hoban and Clifford, 1992) in which the public preferred funds going for environmental protection above funds for highway construction, welfare and economic development and only funding for crime and education had a higher preference.

It would be interesting to assess if this preferences continues and it is widespread.

"Economics" notes that the absence of trees increases dust levels by four to 100 times (Nelson 1985).

It is notable that in the case of Humboldt County, depending upon the size of the particulate matter in the dust, decreasing dust could benefit residents since Humboldt County is in non-attainment for PM10, according to the North Coast Unified Air Management District. Other areas could have similar or related benefits. In addition there are human health benefits from watershed protection, such as increased opportunities for exercise, such as walking and jogging and also better air quality.

7.0 Cost Estimates

The following applies to relatively small watersheds, in terms of area and population, such as the Lindsay Creek Watershed, and without other special features such as the presence of brownfields.

7.1 Commit to Process Costs

The primary costs for this first step involves the time to contact people, organize at least one meeting of the team of people involved in the assessment, follow-up on this meeting and the confirmation of commitments of time from watershed experts and for someone to coordinate the Watershed Assessment process for a particular watershed or set of watersheds. In the case where a General Plan update did not involve any community plans, the additional cost would be to get commitments for applying the Assessment Process to one or more watersheds. For one watershed this step might a minimum of 4 hours of initial coordinator contact time, an additional 4 hours for those contacted, three hours of meeting time for a minimum of 4 people, and 4 hours of follow up time, for a minimum total of 24 hours. At a charge out rate of $50 per hour this would be a minimum of $1200. Some of this could be in-kind, or pro-bono time. The upper range could be 2 or 3 times this amount, $2,400 to $3,600. There would be some economies of scale, for example 10 watersheds would cost less than 10 times the costs for a single watershed. These costs are for the initial commitment to a watershed based approach. This commitment entails other costs related to including watershed issues in policy discussions, public meetings and in drafting policy later in the process.

In the case where community plans are being conducted, in the extreme case, there could be no additional cost; the watershed assessment approach could be incorporated into the existing community plan approach for this Commit to Process step. More reasonably some additional work would be needed to explain the approach and obtain commitment to the approach, so the cost would be some fraction of the cost in the case of a General Plan with no community plan.

7 .2 Scope Issues

7.2.1 Public Participation Costs

The Lindsay Creek Project interviewed "27 people in and outside the watershed considered to be community "leaders" generally well-regarded and/or long-time residents) and decision makers

whose actions affect the watershed" in order to "scope the issues" and develop the survey. Such a large number of interviews was needed as more comprehensive foundation for developing the assessment process and for producing *The Watershed Handbook*. In contrast Humboldt County conducted a public survey to scope issues. The survey was available on line and distributed at meetings. Though such a distribution was open to self-selection bias, the cost of adding a few watershed or ecologically-based questions to such a survey would be minimal.

The simplest, and least costly approach, would be to collect existing documents and briefly ask a few individuals most familiar with the watershed to list issues. This list could be circulated to a larger group, for example through a community group, like a community services district, for additions, deletions or comments. In the General Plan with no community plan case, the above would be additional costs of the assessment. If community plans were typically being developed, then only costs additional to what would be normally conducted in the plans would be considered Watershed Approach costs.

7.2.2 Watershed Assessment Costs

This involves identifying the specific watershed, natural and ecological issues (as opposed to land use issues). This could be achieved by talking with key individuals knowledgeable about the watershed and circulating the list of issues identified. Assessment costs would be those additional to what would otherwise be done. In the case of community plans for several different watersheds, whether there were economies of scale would depend on whether issues in different watersheds were similar and whether an individual contacted was knowledgeable about more than one watershed.

7.2.3 Land Use Research Costs

This involves identifying the specifically land use issues (as opposed to watershed issues). This could be achieved by talking with key individuals knowledgeable about the watershed and circulating the list of issues identified. Assessment costs would be those additional to what would otherwise be done.

7.3 Gather Data Step

7.3.1 Public Participation

For the Gather Data Step, the public participation costs involve the additional costs for developing and circulating a survey and for conducting a public meeting. In the actual Lindsay Creek Project a statistically valid random survey was developed and delivered in person by Fire District staff. A minimal survey could involve a non-statistically valid survey left at local public places, markets, schools etc.

The public meeting is a major expense. Developing the materials for the public meeting, including large maps, publicizing the meeting, arranging and preparing presentations, the time

and cost of facilitation and presenters, and follow-up contact and communication could be very substantial. RCAA staff based on their experience with the Lindsay Creek Project estimates that all the cost of such a public meeting could range from $2,000 to $5,000 for one meeting with a minimum of two meetings considered optimal. This entire amount would be additional in the case where no community plans would otherwise be developed. In the case where community plans would have been developed anyway, the cost of the Assessment would be the difference between the above amounts, and what would have occurred if the Watershed Assessment was not followed. For example, if no community public meeting at all was planned to develop the community plan for this watershed, then all the above costs would be additional. If a public meeting were planned, the Assessment cost would only be the additional costs above and beyond what was planned anyway for the public meeting.

7.3.2 Watershed Assessment and Land Use Research

These costs are for gathering data specifically on watershed related variables and issues. Most General Plan processes include a baseline inventory of natural resource data, so little added costs is involved here. Only the costs above and beyond what normally would be incurred would be counted as Watershed Assessment costs. In any case, researching documents that would not normally be consulted, e.g. possibly fisheries, or water quality documents, would be considered as additional costs. Some additional cost, though, is involved in working with Department of Fish and Game habitat surveys. Here use of student interns, volunteers or low cost staff with oversight by the watershed coordinator would reduce these costs.

The major part of the information collected in the Lindsay Project would have been gathered in a General Plan or in a community plan process. Only the research into more innovative codes, policies, and planning processes were additional. This entailed an additional week of focused research. By using *The Watershed Handbook,* the time for land use research would be reduced by half. In the General Plan without community plan cases, collecting all relevant documents specifically on land use *at a community scale* would be an additional cost and counted as apart of the Assessment cost. These data relate to population and zoning and other land use issues, in contrast, to more natural, ecologically related variables and issues. There would be considerable economies of scale for this step if several watersheds were included.

7.4 Assess and Analyze

7.4.1 Public Participation

Some costs can be incurred in professionally tallying and survey results and matching survey data to other data such as census data. This would fit closer to the Public Participation part of "Assess and Analyze" than to the Watershed Assess and Analyze and Land Use Assess and Analyze categories. The Lindsay Creek Project used an iterative approach to data analysis in that after the social data was collected and analyzed, what was learned was reported back to the community and participants were asked to verify and comment on results. The cost of this follow-up meeting is a cost of the watershed based process over and above what would happen otherwise.

7.4.2. Watershed Assess and Analyze

Any General Plan would process accumulated data in a systematic way. Since the Lindsay Creek Project was independent of and separate from a County General Plan it had to cover all data analysis costs itself. The analysis of watershed data in the Lindsay Creek Project is founded on a more specific level of assessment than a traditional planning effort, be it Community or General Plan. Costs associated with this task include processing data in survey reports and text format, creating GIS data layers, transferring GIS-accessible data layers into compatible formats, and using multiple data layers for GIS-based analysis. While a Community or General Plan conducts some analysis of existing electronic data, the proposed process would involve additional analysis estimated a between $5,000 and $15,000 depending on the area involved, existing data available, format and metadata issues, and economies of scale.

7.4.3 Land Use Research

The major part of the information collected in the Lindsay Project would have been gathered and analyzed in a General Plan or Community Plan process.

7.5 Integrate Results and Develop Recommendations

In this step integration of public participation, watershed assessment, and land use research results occurs together as a single unified process, but as separate sub-steps for each of the above three components separately. The Lindsay Creek Project used a discussion-based process with one team member "representing" one of the three component areas. Although this method is adversary-based, the final priority recommendations reflect the most critical issues from each component. This step could also involve a third or fourth public meeting, or the publishing of a draft report that integrates the results of the survey, and the results of the Assessment and analysis of the Watershed and Land use data.

The recommendations would be presented to the public at a public meeting (and other means). The cost of such a meeting would be $2,000 to $5,000. The part of this cost that is additional to what would have been done otherwise would be counted as the cost of the Watershed Assessment approach. Only the recommendations over and above what would be recommended otherwise would be considered as specifically Watershed-based Assessment Approach recommendations, and these added recommendations would likely include adaptation of the gathered innovative codes, policies, and planning processes compiled through the land use research.

7.6 Implement Recommendations

Some Watershed based assessment recommendations will have continuing costs. For example, recommendations regarding future watershed education or watershed stewardship activities or program would have costs. The "Economics" article notes that in some cases a stormwater utilities fee is levied of $30 per year per household, out of which 75 cents are allocated for watershed education $32 per year and 80 cents for watershed education in 2004 dollars. Monitoring or enforcement of recommendations also would have costs.

7.7 Evaluate Results

The land use pattern resulting from adopting and implementing the recommendations can be compared with baseline or "business as usual" scenarios in which the recommendations are not implemented. Some of the variables to be compared could be comparison of the number and size of large parcels, number of new housing units possible, size and number of miles of buffers, whether sensitive areas are developed, or not, connectivity of habitat, acres in open space and agriculture etc.

7.8 Overall Costs of the Watershed Assessment Process

RCAA staff based on their experience estimate that all of the above process related costs in the case of a General Plan without community plans, could range from a low of $20,000 to a high of $50,000 for a single watershed. The cost for a single watershed might fall to as low as $5,000 if a plan was already scheduled for that watershed and what was planned was easily converted to a watershed based approach, to as high as $50,000 for extensive Watershed and analysis. Economies of scale could significantly reduce the upper end of this range if several watersheds were considered. For example, perhaps for a county applying the Lindsay Creek Watershed Based Approach to 10 Lindsay Creek-sized watersheds, the costs might range from a total of $50,000 to $300,000 depending on whether community plans were already scheduled and on how much of the costs are covered by in-kind and donated services.

8.0 The Balance Sheet

The benefits of the watershed based approach, like the Lindsay Creek Project recommendations themselves, are directed at different types of stakeholders. Property-related benefits accrue largely to individual property owners and residents. Benefits from Cluster Development accrue largely to local governments (such as special districts, cities and counties) in the form of reduced infrastructure construction, maintenance, repair and replacement costs. Non-market, intrinsic values and Public Trust values tend to accrue to the public at large and fall under the jurisdiction of State and Federal government.

Ideally benefits to individuals can be packaged and structured so that on balance, individuals, as property owners and citizens, recognize positive net benefits from a watershed based approach. The benefits to local governments tend to make it in the interest of local governments to support a watershed based approach. Finally the benefits to the public at large and to public trust values can make it cost-effective for state and federal governments to fund and support additional watershed assessment approaches.

9.0 Evaluation Methodology for the Lindsay Creek Watershed Approach

To evaluate use of the Lindsay Creek Watershed Approach the following questions need to be answered:

What is the watershed under consideration?

How is it different or similar to existing political jurisdictions and boundaries for planning purposes?

What would be the planning process in the absence of using a Lindsay Creek Watershed approach?

Would there likely be a Community Plan that included all or most of the watershed. If so, would the Lindsay Creek Watershed Approach be used in this Community Plan?

What are the costs of using the Lindsay Creek Watershed Approach that are over and above what would have been the case otherwise?

What watershed assessment, land use and public participation information was obtained compared to what would have been obtained otherwise?

What are the watershed recommendations that resulted from use of the Lindsay Creek Assessment, especially in contrast to what would have been likely policies otherwise?

In the case where recommendations are not yet adopted, how has use of the Lindsay Creek approach affected the chances of adoption and implementation of these recommendations.

What are the market and non-market benefits associated with the recommendations, particularly in regard to the four tools: protection of large parcels, use of buffers, cluster development and watershed stewardship.

How do the costs and benefits compare?

What are lessons learned that would help improve the process for this or other watersheds?

The next section summarizes answers to these questions specifically in regard to the Lindsay Creek Watershed

10. Evaluation of the Lindsay Creek Project Specifically in terms of its assessment and recommendations for the Lindsay Creek Watershed

What is the watershed under consideration?

The Lindsay Creek Watershed (see Box: Background p.3.)

How does it different or similar to existing political jurisdictions and boundaries for planning purposes?

The Lindsay Creek Watershed is entirely unincorporated Humboldt County land completely containing within it the Fieldbrook Community Services District and the Fieldbrook Volunteer Fire District as shown in maps in the Lindsay Creek Watershed Strategy.

What would be the planning process in the absence of using a Lindsay Creek Watershed approach?

In the absence of the Lindsay Creek Watershed Project no County watershed planning would have occurred during the time the Lindsay Creek Project took place.

Would there likely be a Community Plan that included all or most of the watershed. If so, would the Lindsay Creek Watershed Approach be used in this Community Plan?

There is a possibility a community Plan might be conducted within the next few years. Such a community plan could build on the Lindsay Creek Project, in terms of watershed and land use assessment information obtained and the public participation that occurred during the Project.

What are the costs of using the Lindsay Creek Watershed Approach that are over and above what would have been the case otherwise?

This question is difficult to answer in the case of the Lindsay Creek Project because this Project had two purposes:

i. to assess and make recommendations for Lindsay Creek watershed and
ii. to develop a Watershed Handbook for use by other communities.

As discussed previously in this report in the future a watershed based approach similar to that used in Lindsay Creek could cost $50,000, if done by a non-governmental agency, which was the case for the Lindsay Creek Project. Because the Lindsay Creek Project is an initial experiment in such an approach the costs attributable directed to the Lindsay Creek watershed , separate from the work related to development of the Handbook probably could be considered to be excess of $50,000. The remainder of costs for the project could be considered to be costs associated with development of the Lindsay Creek Watershed and Handbook to be used by other communities and watersheds.

What are watershed assessment, land use and public participation information was obtained compared to what would have been attained otherwise?

The Appendices to the Lindsay Creek Watershed Strategy, summarize the extensive watershed and land use assessment information obtained (see the Strategy's Table of Contents). This includes compilation of existing information, analysis including cross referencing relevant variables, GIS mapping, and community survey data useful to planners and other professionals as well as to elected policy makers and the public.

What are the watershed recommendations that resulted from use of the Lindsay Creek Assessment, especially in contrast to what would have been likely policies otherwise?

The Strategy summaries the many recommendations for the Lindsay Creek Watershed that were developed out of the Lindsay Creek Project.

As noted previously, these recommendations fall into 6 "Priority Management Goals and Recommendations"

1. *Conserving Salmonid Habitat Quality*
2. *Conserving Riparian Habitat Quality*
3. *Conserving Large Parcels*
4. *Reducing Risks of Road-related Sediment*
5. *Reducing Risk of Septic Pollution*
6. *Reducing Risk of Slope Instability*

Also each of these six Priority Recommendations categories are directed at three different levels:

1. *Community Action Recommendations*
2. *Local Government Recommendations*
3. *State and Federal Recommendations (DFG. CDF etc.)*

In the case where recommendations are not yet adopted, how has use of the Lindsay Creek approach improved the chances of adoption and implementation of these recommendations.

The recommendations in the Lindsay Creek Strategy are not part of an official planning process. Consequently their consideration and adoption largely depends on how much they are reflected in the County General Plan and in any community plan for the Fieldbrook area. The data and analysis developed and the community participation in the project increase the likelihood of Lindsay Creek Project recommendations being adopted. How much an increase is perhaps impossible to determine.

What are the market and non-market benefits associated with the recommendations, particularly in regard to the four tools: protection of large parcels, use of buffers, cluster development and watershed stewardship.

This report has discussed several of the possible market and non-market benefits and costs associated with use of watershed protection tools. Net benefits depend on a complex interplay of variables, including the effect of watershed protection measures on property values and the availability and price of housing.

How do the costs and benefits compare?

In regard to housing and environmental quality, this report suggests that maintaining or improving watershed qualities appear difficult to meet in the Lindsay Creek Watershed, if Lindsay Creek's share of the new housing in the County were built, given Lindsay Creek's septic tank minimums. Evaluating costs and benefits for the Lindsay Creek <u>Watershed in isolation</u> depends on the relative weight given to housing and environmental aspects.

What are some lessons learned that would help improve the process for this or other watersheds?

Having a Lindsay Creek Watershed Approach adopted as part by a County planning process would greatly reduce costs. Costs would be even further reduced if the Lindsay Creek Watershed Approach were incorporated into an already scheduled community plan process. In addition the active involvement from the beginning of official community entities, such as the Fieldbrook Community Services District, perhaps could improve public participation.

It would help greatly if the Watershed Approach were applied to an area that included an existing community sewer system. If a single watershed did not possess such an area applying the approach to two or more watersheds simultaneously, at least one of which had an existing community sewer system would be desirable. Doing so would allow more flexibility regarding meeting housing and environmental quality objectives. For example, more new housing could be clustered in areas served by community sewer systems, perhaps in one watershed, and less in another, while achieving the same total number of new housing units.

Overall evaluation of recommendations, once implemented, can build confidence in the effectiveness or efficiency of policies or programs developed or actions taken and help improve the effectiveness of future watershed planning work.

As to the cost effectiveness of the Lindsay Creek Project work in developing and producing the *Handbook* this depends the actual use of the *Handbook* and evaluations of future use of the Lindsay Creek Watershed Approach. In particular the question that need to be answered is:

How many individuals, groups, entities and watersheds learn about the Lindsay Creek Watershed Approach?

This can be determined by the number of visits to a Lindsay Creek Watershed website and by the number of follow up inquiries regarding Lindsay Creek Project information.

Interest in the Lindsay Creek Approach, in part, is dependent on the publicity and website cross-linking regarding the *Handbook*. The next section includes suggestions for a follow-up grant program directed at Counties considering community plans for watersheds. Such a follow-up grant program could increase the use of the Lindsay Creek Approach and eventually provide specific evaluations of implemented watershed related recommendations.

11..0 Suggestions for Further Actions

The planned next step is for dissemination of *The Watershed Handbook* to land use planners, elected officials, state and federal officials and interested community members via a website posting of the *Handbook*. In addition, it is suggested that publicity and cross-referencing of the website be done. In particular County planning officials with jurisdiction over sensitive watershed in counties facing housing growth pressures could be targeted. Letters and email could be sent in addition to announcements in newsletters and more general publications and forums.

Ideally there could be pilot "second phase" funding of watershed assessment for using *The Watershed Handbook*. Good candidates for such a follow-up program would include watersheds for which a community plan is being considered. Such community plans are likely to result in adopted and implemented land use policies. Also it would be good if the affected watersheds could contain, in addition to natural undeveloped areas, areas which are served by community sewer systems and could allow for clustered and in-fill development. Grant funding could cover the additional costs entailed in using the Lindsay Creek Watershed Based Approach. The grant could also require a report on the specific watershed based recommendations proposed and a tracking of their adoption and implementation and an evaluation of the benefits and costs of these recommendations.

The follow-up pilot assessment could help refine *The Watershed Handbook* and watershed assessment process so as to make it a basis for a larger watershed assessment grant program. Requests for proposals for such a grant program could target both single watersheds facing critical growth and protection issues and Counties, which are considering developing plans affecting several watersheds. Funding for such a grant program could come from State, Federal or private foundation sources, or a partnership of some combination of them.

Summary

The Lindsay Creek Project assessed the Lindsay Creek Watershed. This assessment was based on watershed and community concerns. It did so independently and separately from the Humboldt County General Plan process. Consequently all of the costs incurred in the project, though grant funded, can be considered as additional to what was otherwise being done. In addition one of the Project's objectives was to produce a watershed handbook for use by other communities. Consequently more work and more thorough work was involved in the Project than would be the case for future watershed based assessments that did not have to produce such a document for use in other watersheds. The Project also produced specific recommendations for the Lindsay Creek Watershed. These recommendations, if implemented would improve the functioning of the Lindsay Creek Watershed by, among other things, keeping intact large parcels, regulating development in sensitive areas, improving water quality and habitat etc. Specific benefits from use of watershed related tools were discussed in this report. Ultimately evaluation of the Project depends on how much other watersheds communities benefit from the use of *The Watershed Handbook*.

More specifically an "upfront" watershed assessment approach to land use planning patterned on the approach used in the Lindsay Creek Project can have additional costs. Such costs could for a non-governmental organization, range as high as $50,000 per Lindsay Creek-sized watershed. Actual costs, though, would be only those costs additional to what would otherwise be spent. In the case of a County, which already had decided on developing a community plan for a watershed, additional watershed assessment costs could be low. For example, a community plan might be easily structured as a watershed based approach. In addition there are economies of scale such that a County considering watershed assessments for several watersheds as part of community plans could conduct such watershed based assessments at significantly less than the cost implied by multiplying the cost for single watershed by the number of watersheds covered.

Watershed based assessment can result in significant net market benefits, including net increases in property values, lower development and infrastructure costs, reduced road-related costs, as well as in non-market benefits including intrinsic or public trust values, such as improvement in wildlife habitat, increased fish populations, environmental amenities and human health benefits. A watershed-based approach can make economic sense in terms of the interests and values and responsibilities of each of the following types of beneficiaries: individuals and households, local and County government, and State and Federal governments. A *Watershed Handbook* dissemination and follow-up program is proposed. Finally a public and privately funded grant program supporting use of the Lindsay Creek Watershed Based Approach is suggested.

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