HOW-TO GUIDE
FOR
LOCAL HISTORICAL ECOLOGY

San Francisco Estuary Institute
Richmond, California

NOTE FOR VERSION 1.2:
This draft version of the How-To Guide is currently being tested in several Bay Area Watersheds. The revised version will be available from SFEI in early 1999.
Please contact Robin Grossinger for more information: (510) 231-5742 or robin@sfei.org

How-To Guide for Local Historical Ecology

protocols for the inventory and assessment of a watershed
version 1.2
21 July 1998

These are protocols to develop historical maps of a local watershed, plus supporting databases. The protocols cover the collection and analysis of historical information about people and the land, in the context of the Bay Area Watersheds Science Approach of the San Francisco Estuary Institute.

Why look back?

Taking care of a watershed requires a vision of its good health. To achieve the vision, it must be translated into a set of objectives for maintaining or increasing selected ecological resources. The objectives should follow from scientific assessments of what is possible and likely. Such assessments should reflect an understanding of events and processes that control the distribution, abundance, and quality of habitats. This kind of understanding comes from measuring environmental change. The measures of change must involve comparisons between the past and present conditions. When change is understood, then the past helps explain the present, and helps reveal the future. Taking care of a watershed should therefore begin with a look at the past.

For a variety of practical reasons, looking back at the history of a watershed is the best way to start to plan for its future. Many people in the Bay Area do not generally appreciate how they can influence their home watersheds because their residency has been too short to provide them with a sense of local history. Most of the recent arrivals literally "buy-in" to existing local conditions, with a mortgage or rent, without knowing what has been lost or gained through historical environmental change. Caring for local watersheds tends to get bogged down by debates about alternative solutions to environmental problems that are not well defined, in large part because there is a lack of basic historical information to explain how the problems have evolved. An inventory of past conditions is a way to "come to terms" and "find common ground" for watershed residents who are engaged in even the most contentious debates about watershed concerns and issues. Furthermore, many people enjoy the discovery of their past, which includes the history of their home watersheds, and are willing to participate in an inventory of local historical conditions.

What is “historical ecology”?

Historical ecology literally means "documented" ecology, and can refer to the documentation of environmental change through time. The Bay Area EcoAtlas is a database of the distribution of habitats and species at different time periods. The challenge is to bring historical and modern environmental data together, to begin to understand environmental change and look towards the future. Often both historical and modern data are lacking for that effort. This Guide addresses the compilation of historical ecological data into historical maps and databases. The value of such an effort is tremendously enhanced by developing equally detailed maps of modern habitats.

As described here, an historical map represents a careful effort by modern-day watershed residents to inventory and portray earlier conditions in the watershed, based largely upon historical documents. The earliest historical map will show the native landscape, meaning the environmental conditions that existed under recent Native land use, prior to most European effects. Subsequent historical maps might show the landscape at intermediate stages between the Native landscape and the present, such as during the time of maximum agriculture.

An historical map is necessarily a rendition of many separate pieces of evidence of the location, size, and shape of landscape features. The evidence will vary in clarity and authority. For some things, like some mountain tops, historical changes have been slight, such that the past and present conditions are essentially the same, and obviously well known. For some other things, like some rivers and creeks, changes have been so great and so rapid that the historical conditions can only be guessed. An historical map therefore must reference one or more companion databases and a text that saves all the evidence and describes how it has been used to make the map.

The native landscape will be revealed through careful examination of modern and historical government documents, maps, photos, oral histories, and drawings that serve as windows to the past. Not all the evidence will pertain directly to the time of European contact. Some of the evidence will pertain to natural, but more recent, conditions. And some evidence will pertain to very temporary conditions that naturally change. Overall, the Native Landscape map will therefore be a composite picture of average, natural conditions characteristic of the native landscape.

The Agricultural Landscape map will portray conditions at an intermediate stage in European land management, when the landscape is used for major food production prior to extensive urbanization. The date of this period will vary by watershed and be determined through local research.

Three basic aspects of historical ecological research should be considered. (1) the landscape is dynamic, not static. Every map of ecological condition is immediately out of date and is inherently wrong, at some level of detail. (2) The map will show what you want it to show. There must be rules to decide what to show, and in what detail. (3) The magnitude and extent of historical changes have been so great as to nullify most concerns about our inability to produce an exactly accurate map of the native landscape. The best historical map that you can produce will probably be good enough to illustrate local environmental change, and to help set appropriate goals for the future of your watershed.

Why a map?

Historical ecological research in the Bay Area is challenging. A reasonably accurate picture of past conditions must be developed from a few fragments of remaining examples of native lands, plus many isolated, unconnected, intriguing, sometimes confusing pieces of evidence gleaned from a variety of different sources. Making a map is the single best way to integrate the facts into a coherent picture. The process invites abundant critical thinking. The most certain facts evolve into a geographic template for arranging other facts of lesser certainty. Problem areas reveal themselves and invite more focused efforts to discover clarifying evidence. The recognition of spatial patterns among landscape features leads to map adjustments. Our understanding of the land grows rapidly as the map gains detail and believability.

A map is more useful than a narrative account of historical facts. A map shows how the facts relate to each other and to local geography. An interesting aspect to historical research is that much of the information is found away from the pace to which it pertains. For example, the journal of a local pioneer in Napa or Santa Clara might be found in a library or family archives in Portland or Paris. The historical records of local creek flows for Walnut Creek might be found in the Water Resources Library at Cal, or in the archives of the US Geological Survey in Menlo Park. Information about the land tends to move around with people, or to settle in sometimes distant repositories. Making a map brings the facts back.

The best maps are more than compilations of existing information. They produce new insights. A general fact like "logging occurred in the Glen Ellen district of Napa in the 1880s," becomes, "logging in 1886 on this southwest facing hillside was the largest source of sediment headward of the storage reaches of the stream." Anecdotal information that can be very useful but hard to organize has a place to reside in a map. For example, a statement like "my grandfather fished this creek" becomes "a local farmer fished the creek for steelhead at this deep pool in the middle of this meander bend, where two culverts are planned to drain a proposed shopping center." The anecdote becomes a useful part of the history and planning of an existing project site.

A map of the native landscape lets us visualize the general shape, size, and spatial relationships that tend to exist among natural landscape features and habitats. The map shows how topography and climate have operated locally to shape the land and to control the distribution and abundance of water. Since these controls have generally not changed during historical times, the map indicates where habitats of different kinds would tend to develop naturally today. With this information we can begin to:

- understand the relative influences of natural processes and human operations on historical changes within a watershed;
- determine what habitats characterized a region, some of which may have been completely forgotten;

- determine the relative amount and spatial arrangement of different habitats which successfully supported indigenous and migratory species in recent times;
- assess the local appropriateness of landscape behavior models (seismic response, fire response, flood prediction, ecological response) developed for other regions;
- develop management practices based upon natural habitat controls.

Without an historical perspective, policies and prescriptions for the recovery of ecological resources can only be based on disturbed and artificial conditions, and will therefore tend to fail expensively. A map of native landscape form and function can be used as a template for successful ecological planning.

Step 1: Define the Scope of the Project

Choosing the geographic scope of a project is an important decision. For example, choosing too large of an area could overwhelm your resources and time. On the other hand, choosing too small of an area may not make it possible to find enough data to describe usefully the project region in enough detail. We recommend beginning the search for data with the largest possible scope in order to benefit from the economies of scale. The project scope can later be reduced at the point of data integration and/or GIS production.

Any study boundary is to some extent artificial, since species, habitats, and processes will cross it. To minimize the constraining effects of the chosen boundaries, it is best to use a natural ecological or geomorphic transition that is visible at the scale of study, such as the edge of one or more watersheds, or the edge of the bay. Inevitably, questions will arise about the area just beyond the study boundary. Thus, it is useful to make some note of what lies immediately outside of the study area and might become important later.

To help guide the research effort, it is useful to develop a series of illustrative research questions. These questions should take into account understandings of the past that are necessary to inform current management issues in the watershed. Ideally, they should be formulated at the start of the project with the project geomorphologist, and revisited throughout to provide insight into any questions raised by the modern fieldwork (e.g., *This bridge appears to be causing substantial headward erosion–when was it built?*). Below are some starting points, which can be supplemented based upon local concerns.

Where were the ducks before there were duck clubs?
Did Permanente Creek connect to Stevens Creek?
Where were the best fishing spots? Where were the swim holes?
When did bridges and diversions go in?
How deep was the creek? How high was the bank?
Where did logging operations take place?

Historical data is collected and integrated in the context of current understanding of landscape processes. To make an historical map of a particular place, a team of researchers attempts to answer the basic question: what was the distribution and abundance of the major habitat types under recent native management? Once the place is chosen, a list of expected habitat types is started. This list will likely evolve substantially through the project as more information is learned. In the beginning, a general starting list for watershed inventory would include the habitat types shown on page X.

In addition to the major habitat types, the team collects related information about land use, including fishing, grazing, water diversion, bridge building, the growth of neighborhoods, and more. This information shows how the land has supported people at different places and times, and helps to explain landscape change.

Checklist:

How might answers help understand current issues?

Step 2: Start an intensive, community-based search for historical data

A fairly massive collection of historical documents must be assembled to build a robust picture of the historical landscape. The risk taken in basing an historical picture upon a only few sources is that it will also reflect characteristics of the source documents themselves, not just the actual character of the land. A diverse array of documents–varying widely in format, scale, resolution, original purpose, production techniques, time period, language–will provide a range of views on the landscape, from which an accurate picture can be compiled. Finding these sources takes a persistent, dedicated effort. Once the search is begun, however, and as community awareness develops, valuable materials will continue to be discovered almost by accident.

Historical data is scattered throughout the community, and also in places beyond the study area. The historical search is a treasure hunt in which hundreds of people provide the clues. Phone logs and a database are essential to keep track of the people and institutions which have been recommended and need to be contacted, contacted but not visited, visited and not visited again, focused on further. In the list below, we show a sampling of the places where data can be found. The Contacts database contains our full list of sources to-date and a standard format for tracking contacts.

Use your imagination: valuable information can be found almost anywhere. Human culture and the landscape are intertwined, so ecological information is imbedded in the products of our culture. The shared life of land and people can be discovered in the placement of buildings, the names of streets, the designs of duck clubs and golf courses.

Remember that you don't know what you might find. You will begin to realize that you are investigating a place that you are not familiar with, a place where you've never been, even though you may live there now. In the absence of detailed historical reconstructions many assumptions and expectations have grown about the historical landscape, often based largely on the places people lived before they moved here. Don't take anyone's word for it–ask how they know and go to the original source. During interviews with longtime residents, try to find out more about them–the clarity of their memory, their interactions with the land, etc., in order to help interpret their descriptions.

Potential Sources of Data

Explorer's Journals
Spanish Land-grant Case Transcripts
Spanish Land-grant Case Disenos
Travelers' Journals
Newspaper Articles
Hunting Magazines
Hunting Records, Licenses
Duck Club Records
Engineering Reports
Soil Surveys
Early Research Papers
Early Botanical and Zoological Surveys
Archaeological Data
Master's Theses
Federal Maps (US Coast Survey, US Geological Survey, US General Land Office)
State Maps
City and County Maps
Oral Histories
Town Histories
Local Agency Records (fire dept. logs, water district flow records)
Paintings and Drawings
Photographs (oblique and aerial)
Names of Streets and Businesses
Local Names (streets, parks, creeks, businesses)

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Grab all potentially relevant materials. Get copies. Find some file cabinets and map drawers. Maps can be useful and also quite large. Map drawers help tremendously. They are often sold inexpensively or discarded by local agencies. A simple organizational system can organize the materials by area and type. In some cases it will make sense to file similar type materials together; where there are not many of a particular type of map or report, it might be filed alphabetically by author. If the scope is large enough it may be useful or necessary to choose one or more spatial templates for organizing and cataloguing data. For example, our regional archive is divided into folders for each county. Other folders are dedicated to one common of document type, such as the US Coast Survey Maps, or to materials which show the whole region rather than a county. In a watershed study, large amounts of a particular type of data might be organized by subwatershed or by geomorphic unit (e.g., bayland, lower valley, upper valley, east hills, west hills). The organization of the archive should correlate to the database, so that the database can point people to the materials.

Keep a notebook. Your field notebook is the place to keep track of all the leads you are pursuing, ideas you have, questions that arise, and new information while you're in the field. Key information is then inputted to the database.

Potential Places to Find Historical Data
City and County Libraries
University and Colleges (Libraries and specific departments)
Historical Societies
Local Agencies (Public Works, Water District, Fire Dept., Planning, etc.)
Sacramento: California State Library, C. S. Lands Commission
National Archives (San Bruno and Silver Springs, MD)
Museums
Herbaria
Personal Collections
Researchers' Archives
Recreational Clubs (Rod and Gun, Sailing)

Building an historical map is a team project. No one person could possibly find, organize, and interpret the voluminous amount of materials involved in compiling a detailed the historical map. A team is needed to visit as many places and contact as many people as possible, and to organize the materials into a well-functioning archive and database. It is useful to have people from different parts of the region and with different backgrounds to come up a range of approaches for finding data. It is true that the same people going to the same library discover different materials. Each of SFEI's project interns turned up at least one important piece of information, without which the picture would be significantly different. Areas of focus help develop research expertise. Interns can focus on specific geographic areas (a county or city, the lower watershed), source materials (Spanish land-grant materials, local newspapers), or major archives (UC Berkeley Bancroft Library, State Library).

Somebody needs to coordinate. A core person or couple of people need to examine materials as they come in, making preliminary interpretations, and providing guidance to the field researchers ("this is really great," "get more things like this"). The task of field researchers is to sort through huge amounts of paper to select potentially relevant documents, generally rejecting 90% or more. Without feedback as to what is useful and what's not, the search would spin out of control. At SFEI, a senior scientist provided overall guidance, and two full-time coordinators interacted closely with the interns, assessing materials as they came in.

Maintain a database as the foundation for the map. A database cataloguing contacts and materials should be maintained to allow researchers (who are generally working 1-2 days/week on different days) to communicate so that duplication of effort is avoided. When you go to a place, fill out database forms for each place you go to, describing what was there and what, if anything, it might be useful for. As you learn more, you see the same material differently. Places overlooked previously become important. If you don't make copies, take detailed notes about what the material shows and why you didn't collect it.

We recommend developing several linked databases. The first two organize Contacts (who have we talked to and where have we gone) and Materials (what we have, where we got it, where it is now). The third documents the integration of historical evidence into the landscape features of an historical landscape map. The fourth links data about the changing landscape to the map (Environmental History Database). By dividing different types of information into distinct, linked databases, each has a simple design and duplication of data is minimized.

The databases are simple to implement and save a tremendous amount of time by organizing the ongoing search. They minimize frustrations over collecting the same materials and calling the same people. They provide a body of references to community resources for historical information in the region. They create a structure for adding new information to the map. They also suggest which materials and institutions were not used and might contribute new data.

Checklist:

Scope

What is the geographic scope?

Is there a useful spatial template for organizing data (by counties, watersheds, watershed parts, subwatersheds)?

What are target time periods?

What are key guiding research questions?

What does each person think would be valuable stories or images to find?

Who

Who are search team members?

How much time do they have?

Does anyone know languages besides English (in California, esp. Spanish)?

Who has potentially useful community connections?

Discovering community resources

What materials might provide information?

Where do we know we want to look for data?
Who do we want to contact for data?
Are there people from out-of-town who should be brought in?

Community announcement

Which newspapers and when for articles?
Mailings? Presentations?
Can we tag on to any ongoing local projects or events (i.e. local history celebrations, relevant mailings, newsletters?

Coordination

Who goes where?
Which places require a car or public transportation? Who can visit these?
Who organizes data at the homebase?
What funds or in-kind services are available for xerox copies? Photographic copies? Storage furniture (map drawers and file cabinets)? Stipends? Salaries?

Archive Organization

Where are materials stored?
How are they organized?
What database is used (what platform/computer)?
What level of public access to the archive is anticipated?
Were will the archive be maintained in the long term?

Technical Supervision

Who supervises the technical aspects of the search?
Who are the senior scientist and historian advisors?

Documentation

What do you want to deliver to whom?
Do you want to record oral histories, field-trips to remnants, and the search in photographs or video?

Step 3: Interpret, Integrate, and Map your Data

The interpretation and integration of historical data takes place through the compilation of small details over large areas. The accumulation of local detail determines the strength of the resulting picture. It is a matter of focusing on minute ponds and creek meanders while at the same time considering patterns over large areas.

The process of integration is largely a series of fortuitous instances of overlap between different documents corroborating and extending information and allowing interpretations and assessments of accuracy to be made. Breakthrough interpretations are often only possible in one place where several materials overlap (e.g. one material describes in words a site shown by another material with a unexplained symbol type, which is also found widely in other areas) tend to apply to other places.

Materials of covering both large (generally describing a smaller area) and small (describing larger areas) scale tend to work together. Large-scale documents covering small areas reveal details and provide fine-grained resolution in limited places, which may apply to other places. Documents covering larger areas provides context, indicating how places relate to each other. Areas are often described, and become understood, in contrast to each other. For example, in 1823, Father Altamira explored the northern Bay Area to identify possible sites for a mission. In an extremely detailed account he assessed the relative amount of surface waters (freshwater ponds, lakes, spring, the perennial extent of creeks), pasture (grassland), and timber (woodlands) in the Sonoma, Napa, and Suisun valleys. here, examination of three large, adjacent valleys. Here useful information about each watershed emerges only when three large, adjacent valleys are studied.

Many historical materials cover a lot of ground, making a wider area of study very practical. Early Spanish explorers slowly trekked from the South Bay to the Central Bay in a day, taking detailed notes of the changing terrain. A single USCS surveyor, David Kerr, mapped over 100 square miles of tidal marshland in the South Bay, Central Bay, Petaluma, and Napa marshlands between 1855 and 1860. To gain the thorough understanding of the meaning and limitations (e.g. of land grant case maps, a certain USCS surveyor, an early Spanish explorer) which allows intelligent interpretation requires a lot of time, and only becomes efficient when you can follow that material or person around a large area like the Bay.

Acquiring a lot of different types of historical materials is useful because different documents end up serving different functions (showing different habitat types, assisting the location of features, showing landgrant boundaries, you will need to work at a variety of scales.). Documents which seem useless at first glance because they don't contribute additional ecological information, often become essential links to understanding an important document because they provide information (e.g., local names or the locations of roads) which assists in locating or interpreting a feature on another material. For example, federal maps (i.e., USGS, USCS) will have a certain, relatively uniform level of detail and information that can be useful, even as an underlying basemap. Local maps, while highly variable and unique, will often provide a larger scale and more information about landmarks, boundaries, and streets which may be referred to on other written materials, maps, sketches, photos, paintings.

Learning History

Previous historical training does not seem to be critical, but learning on the job is. Discovering knowledgeable elders who can guide one's education is invaluable. (We would like to thank particularly scientists at the California State Lands Commission (esp. Dave Plummer and Rand LaForce) and US Geological Survey (esp. Ed Helley) for teaching us about early maps and history.)

The exploration of local landscape change invites learning about the cultural history of the region. At the same time, understanding the social context for historical documents is essential to interpreting them correctly. Each document was produced for specific purposes; these goals determined what was shown and what wasn't, and how places were depicted or described. In addition, understanding the technical methods used to produce materials aids accurate interpretation tremendously. Some surveys were done from boats and some from land, some maps made in the field and some constructed later from notes, some accounts were written originally in Spanish and translated to English. Each of these processes can result in substantial differences in the resulting depiction of the same place. As understanding of documents increases, the depth and accuracy of interpretation grows.

The Coast Survey, which focuses on the shoreline of the Estuary, including most marshes and some of the flatlands, forms the backbone of our regional maps because of its unequaled accuracy and detail and early coverage of the region. The USGS, which covers almost all of the landscape but tends to follow urbanization, is at a much smaller scale than the USCS (the same object is 36X smaller), and has no riparian or woodland information, adds another layer of information which is superseded by USCS or detailed local maps in many places but provides the sole source of information is some areas. Spanish disenos are extremely variable in accuracy and often difficult to geolocate but provide remarkable detail and descriptive information. Many other sources are needed to assist in their interpretation. Early written materials add both specific descriptions, particularly riparian, woodland, and freshwater, and general descriptions of the ecological character (dry, wet, wooded, etc.) areas. These can serve as the invaluable starting point for interpretation of an area.

Every source offers its own orientation, limitations, and opportunities. As sources are examined a mosaic of overlapping and reinforcing information develops. A system which allows you to record the certainty and supporting data for each feature allows the fullest use of available data while accounting for variations in confidence.

Certainty Levels

Certainty levels make it possible to record the range of clarity and definition of different parts of the map. There are three levels of certainty, ranging from the most confident to the least: high, medium, and low. Each individual feature–e.g. a pond, creek, forest–is assigned high, medium, or low certainty for each of three types of certainty: presence, size, and location. The assessment of certainty level is based upon a simple table of standards which is developed in the early stages of interpretation and integration.

Presence refers to the existence of the feature at the target time of mapping. H*ow confident are we that there was a feature here?* Determining the certainty of presence is based on the scholarship of sources and experience interpreting them in a geomorphic and ecological context. Certainty of presence of a feature may increase as more is learned, or decrease as a hypothesis is proved wrong.

Size refers to the area of the polygon used to represent the feature. The assessment of size accuracy is generally based on the growing understanding of the qualifications and limitations of sources. This understanding is based on research into the origins and purposes of documents and comparisons of depictions of the same feature represented by different sources. For example, certain surveyors of the USCS are calibrated to high level of certainty by comparison to aerial photography. Comparison of USGS and spanish maps to the USCS indicates the degree of detail and accuracy associated with many other materials.

Location refers to the placement of an historical feature on a modern map. Some written documents or imprecise sketches may allow a feature to be located in a general area (between Alameda and San Lorenzo Creeks, closer to the bay than the hills), but the actual placement of the feature must be made based upon the best judgment of the researcher, based on other ancillary information. This feature might receive a low level of certainty for location, meaning that the possible range of geolocation for the feature is estimated to be about 1 mile. The feature is probably within 1 mile of its true historical location. When more precise control is available, the range of geolocation may be measured as one-half the distance between the furthest possible alternative placements of the feature based on available horizontal control points.

The standards shown below are used in the Bay Area EcoAtlas Historical View. It is likely that for watershed efforts operating at a larger scale, the quantitative standards for location may be smaller. Additional types of historical data may suggest additional or different types of certainty which should be recorded. Remember that the certainty levels should make organizing and integrating data easier. If they are not working for you, change them. If the codes aren't reflecting what you want to indicate, the system is wrong, not you.

Certainty Level Standards

	PRESENCE	SIZE	LOCATION
HIGH	Presence well-supported: "*Definite*"	Size well-controlled (+/- 10%)	Location well-controlled (within 500 feet)
MEDIUM	Presence well-supported, with some qualification(s): "*Probable*"	Size not well-controlled but evidenced (+/- 50%)	Location not well-controlled (within 2000 feet)
LOW	Presence not well-supported: "*Possible*"	Size not well-controlled and not evidenced (defined case by case)	Location not well-controlled (within 1 mile)

Low certainty occurs when there is a substantial lack of data. Additional evidence may clarify lower certainty features. Presence is low when there is little evidence for a feature but enough that it is desirable to record its possible presence. Low certainty presence because the map reproduction is very faint, barely showing the feature, or because a description seems to infer the presence of a habitat but with little confidence. Presence can also be low if the feature is shown only on a relatively recent map and there is substantial concern that it is a recent product of land use. Size and location are generally of low certainty because they are not shown graphically and must be inferred based upon a written account and indirect data such as topography, soil type, or adjacent features.

Medium certainty arises when there is solid evidence but with significant qualification. Medium certainty of size and location often occur when a feature is clearly shown by a map which is not highly spatially accurate.

High certainty arises when maps or accounts whose validity has been demonstrated by scholarship provide clear evidence with standard interpretation.

During the process of integration, a sense of the range of certainty found in different situations will develop. As soon as possible, force yourself to write down preliminary standards, using examples of typical situations. Then revise the standards as you proceed. But make sure to write it down, or you may find yourself in the confusing situation of using different standards in different places.

Using certainty levels might at first seem laborious, but it actually makes integration much easier. Once your set of certainty standards is well-tuned for the range of situations you are encountering, it enables you to efficiently use source materials of a wide range of accuracy while not focusing unduly on unsolved questions. If areas of lower and higher relative certainty can not be distinguished in the final map, the map effectively takes on the level of certainty of the lowest quality feature. With certainty levels, the map and associated database allow key questions to be highlighted and notes about interpretation to be recorded for future research.

Mapping

A variety of methods can be used to bring historical data into a modern map. We used several approaches, developed to most efficiently capture different types of data. Where a substantial amount of data is available on historical maps with strong horizontal control, such as USGS or USCS surveys, we digitized features directly into GIS. To convert data in historical coordinate systems to modern coordinates we used (1) in some cases, the Dedrick shift which uses a numerical adjustment to the control points, or (2) persistent topographic or cultural features which could be identified in the historical maps and modern GIS data.

Where there is a relatively small amount of data on a map, or the map does not have strong horizontal control, or the data must be integrated with other materials to define a feature, it is more efficient to trace the information onto a modern basemap. Substantial work can be required to effectively transfer the feature onto the modern map while assessing the uncertainty of registration. In this way, however, integration occurs through the process of drawing. A single, best-interpretation picture based upon all available sources, local modern topography, and relationship to other features is compiled place-by-place.

We drew first directly upon a basemap extensively to get a feel for the emerging historical landscape and the challenges in interpretation and registration. This was a very useful step. To facilitate scanning or digitizing, though, the final goal of a handdrawn map should be the most simple and clear linework. We used blackline pen on mylar, registered to USGS 7.5 minute Quadrangles.

GIS Protocols
(to follow)

Public Distribution
(to follow)

Checklist:
Which types of certainty apply to the data collected in the project?
What are appropriate standards for high, medium, and low certainty levels for each type of certainty?

What scale should the basemap be?
What type basemap? (aerial photograph, USGS quadrangle, city or county maps)

What additional scientific assistance or review is needed?
Should there be an integrating workshop?
Who should be brought in for that?

Which data should go into the GIS?
Which GIS (platform, location)?
Who does the GIS work?

Appendices

1. EcoAtlas Historical Research Form: People and Organizations

2. EcoAtlas Historical Research Form: Data Sources

EcoAtlas Historical Research Form: PEOPLE AND ORGANIZATIONS

(where to look for historical data)

Record Creator____________________ **Date Created**____________ **Date Updated**_______________

Person and/or Place Information:

Name: Prefix (e.g., Ms.) ____ First _______________ Middle ________ Last ________________________

Organization____

Street Address____

City __________________________ Zip Code ____________ County ______ State _____ Country ______

Phone Type_________ Area Code_____ Phone Number_____________________________ Phone Ext._____

Facilities: Copying_________________________ Borrowing______________________________________

Access: Transit______________________________________ Hours_________________________________

Scope *(choose one: the area which most closely covers the full scope of the available info w/ regard to the Bay Area; see map):*

Full Bay Area ☐

Major Subregion: Suisun ☐ North Bay ☐ Central Bay ☐ South Bay ☐

Watershed Group:__________ Watershed:____________________ Subwatershed:______________________

County:__________ **Keywords (habitats, common place names, watersheds, land-use):** _________________________

Notes: ____

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EcoAtlas Historical Research Form: PEOPLE AND ORGANIZATIONS

(where to look for historical data)

Record Creator____________________ **Date Created**____________ **Date Updated**_______________

Person and/or Place Information:

Name: Prefix (e.g., Ms.) ____ First _______________ Middle ________ Last ________________________

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Street Address____

City __________________________ Zip Code ____________ County ______ State _____ Country ______

Phone Type_________ Area Code_____ Phone Number_____________________________ Phone Ext._____

Facilities: Copying_________________________ Borrowing______________________________________

Access: Transit______________________________________ Hours_________________________________

Scope *(choose one: the area which most closely covers the full scope of the available info w/ regard to the Bay Area; see map):*

Full Bay Area ☐

Major Subregion: Suisun ☐ North Bay ☐ Central Bay ☐ South Bay ☐

Watershed Group:__________ Watershed:____________________ Subwatershed:______________________

County:__________ **Keywords (habitats, common place names, watersheds, land-use):** _________________________

Notes: ____

EcoAtlas Historical Research Form: DATA SOURCES

(books, maps, photographs, and other sources of historical data)

Record Creator__________ **Date Created**__________ **Date Updated**__________

Source Information:

Title__________

Creator Name __________

Creator Organization __________

Publication Year __________ Scale __________ # of Pages __________

Location/Organization *(where source was found)* __________

Source Code *(e.g., call #)*__________ Media __________

Form: *analog/digital* Authenticity: *copy/original* Completeness: *full/partial*

Scope *(choose one: the area which most closely covers the full scope of the document w/ regard to the Bay Area; see map)*:

Full Bay Area ☐

Major Subregion: Suisun ☐ North Bay ☐ Central Bay ☐ South Bay ☐

Watershed Group:__________ Watershed:__________ Subwatershed:__________

County:__________ **Keywords** (habitats, common place names, watersheds, land-use): __________

Notes:__________

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EcoAtlas Historical Research Form: DATA SOURCES

(books, maps, photos, and other sources of historical data)

Record Creator__________ **Date Created**__________ **Date Updated**__________

Source Information:

Title__________

Creator Name __________

Creator Organization __________

Publication Year __________ Scale __________ # of Pages __________

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Notes:__________