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Non-Profit Law and Science for Global Resource Solutions

Strategic Plan

2005-2010

INTRODUCTORY NOTE

As the Natural Heritage Institute passed its fifteenth anniversary, we decided to reflect on where we have been and how we should now deploy our capabilities to most effectively address the most pressing contemporary challenges to the natural processes that sustain human life and vibrant ecosystems. More particularly, we wanted to identify the solutions that a relatively recent, small and specialized organization of our character could contribute.

As we look forward, naturally we will build upon the trajectory we have already established. The current portfolio of projects is not geographically circumscribed. Hence, the scope of our forward thinking is at the global scale. Yet, the purpose of this Strategic Plan is not to document the *status quo*, but rather to chart the next steps and new departures that can expand our reach and improve our grasp. It is intended to tighten our focus without cutting off opportunities to make a difference, to project a more distinct identity and personality without departing from our established reputation, and to guide our efforts in the years ahead without presuming to prescript a future that will necessarily continue to be as dynamic as the world we aim to shape.

WHO WE ARE

Within the ecology of conservation, the niche NHI seeks to fill can be described in terms of the natural resources we address, the tools we wield, and the roles we fulfill.

Substantive Focus: NHI's core mission is to restore and protect water-dependent ecosystems and the services they provide to sustain and enrich human life. We work in watersheds worldwide, including transboundary systems, that have been significantly altered and those where intact aquatic systems of exceptional ecological value are subject to eminent development pressure. We pursue an integrated systems approach that includes entire water-centered landscapes from headwaters, to floodplains, to wetlands, to estuarine systems, to the near shore environment, and includes both groundwater and surface waters and their interactions.

Tools and Techniques: Our commitment is to assure that the interests of the natural environment are integral to water resource planning and decision-making. While ultimately a law firm that advocates as an engine for social change, NHI conscientiously predicates its action agenda on a sound technical and scientific foundation, even when that may lead in unfamiliar directions.

To that end, NHI brings exceptional professional skills and insights that engage a full range of relevant disciplines in forging solutions. Yet, in formulating and executing our projects, NHI's reach is not limited by the capabilities of our resident staff and board because we routinely recruit into our project teams, as necessary, state-of-the-art expertise drawn from external institutions. As with analytical methods, NHI's toolkit for legal and institutional solutions is not limited to application of the already-established legal doctrines and processes. Others can readily do that. Our job is to progressively develop new approaches, processes and institutional arrangements.

Our range of tools and strategies to influence the ways in which water resources are managed includes the development and deployment of hydrologic and water resource systems models, on-the-ground ecological restoration projects, the design of improved management and institutional arrangements, policy analysis, and legal advocacy and interventions. Practical realities also shape our tools. NHI is not a membership organization. Thus, we are not generally positioned to be legislative advocates. We are more likely to utilize judicial and administrative tribunals to implement our solutions. Yet, the challenges grow apace, and so must our tools and techniques. Increasingly, we will be utilizing market-based transactions to achieve our goals, and media outreach to influence public opinion.

Roles and Relationships: NHI acts as both a representative of environmental interests and a counselor to the ultimate custodians, managers and regulators of water resource assets. Somewhat uniquely, we operate both within and outside of the policy-making institutions. We typically bridge across institutional boundaries, often working in creative partnerships with other governmental and non-governmental organizations. Whereas these government agencies and the private resource custodians are often absorbed by the urgent at the expense of the important, NHI has the advantage of being able to take the longer view and illuminate the transformational solutions that loom beyond the conventional planning horizon.

NHI addresses the economic incentive structures that tend to discount future values in favor of present ones in resource management decisions. Our belief is that if the incentives can be rectified, the custodians, consumers, managers and regulators will make the right decisions. Thus, market mechanisms and the elimination of perverse subsidies are important tools, and distributional impacts of resource policies are necessary considerations.

Finally, NHI targets systemic improvements and tool development rather than place-based or species-specific conservation actions. To be sure, our projects generally take place within a particular geographic context. But, while the local

conservation improvements are important, our objective is to demonstrate tools or techniques for broader propagation.

We choose to focus on river systems and freshwater ecosystems for three principle reasons:

- Capacity:** Our demonstrated expertise, as described above,
- Need:** The exceptionally distress of these systems and their ecosystem processes, as discussed below,
- Coherence:** The functions and dysfunctions of much of the terrestrial landscape register on rivers and their basins, which therefore serve as a good basis for integrated environmental planning, analysis and action.

WHAT WE FACE

Rivers and the periodic inundation and replenishment of their lakes, floodplains, wetlands, estuaries, deltas and groundwater systems comprise the primary physical components of aquatic ecosystems. Yet, the intensive development of these aquatic systems is transforming the planet. Lost are a myriad of ecosystem services, including spawning and nursery habitat for fish; wetlands and riparian forests; floodplain food, forage and fibre production; nutrient cycling that drives the entire riverine food chain; flood attenuation; a myriad of land uses that depend on natural groundwater replenishment; water supplies; natural water purification systems; recreation; and the beauty and serenity of pristine waterscapes that have fed the human spirit for time immemorial. As a consequence, aquatic ecosystems are in *extremis* around the world. Several recent estimates agree that some 35% of modern freshwater species are now extinct, endangered, or in sharp decline, a degree of peril perhaps more severe than any other type of ecosystem.

There are many reasons for these losses of natural and human amenities, but, overwhelmingly, the causes are

- alteration of natural flows and the associated physical changes to river channels and floodplains due to storage, diversion, channelization, and groundwater extraction projects,
- conversion of wetlands to farmland
- invasions of introduced species and
- adverse changes in sediment loads, temperatures and dissolved oxygen in rivers

Examples of these challenges from NHI's current and prospective work include:

Intensive Development of Wetlands. Most of the largest wetlands complexes have been drained, diked and filled to reduce their exceptionally fertile soils to farmland. The delta at the confluence of California's two major river systems, once the most extensive wetland west of the Mississippi river is now a mere remnant, having lost 97% of its former expanse.

Flow Disruption. Many rivers have been dammed into a series of sterile impoundments, such as the Columbia, La Plata and Tennessee. Others await a similar fate, including the great river systems of China's Yunnan province. Some 45,000 dams have been constructed for irrigation and municipal water supply, hydropower, flood management and navigation around the world. Two-thirds of these are in developing countries. Many more are in prospect, particularly in Asia. This infrastructure generally separates rivers from their floodplains by reducing the high flows that cyclically and episodically inundate the floodplain. Isolating the channel from its floodplain typically results in the loss of these ecosystem benefits that formerly fed human economies and livelihoods. Often the regulated flows have resulted in incised river channels that have isolated their formerly productive floodplains, including the lower Zambezi, and the Trinity. And all of this is but a down payment on the impending alterations as the inexorable growth in human demands renders access to freshwater ever more precarious, especially in the arid zones of the developing nations.

Water Diversions: Water diversions and groundwater extractions deplete even the minimum flows necessary to maintain fisheries. Many perennial rivers have been rendered intermittent and are entirely desiccated though formerly productive reaches, such as the San Joaquin and Rio Conchos. Groundwater mining is depleting base flows in ecologically important rivers in many places.

Loss of Sediment Processes. Disruption of natural sediment processes—either through massive accretions or massive depletions--has also transformed stream channels, floodplains, deltas and shorelines causing flood hazards at one extreme and static, incised and unproductive stream channels at the other. Sediment processes are as important as flow processes for the biological health of river systems, and even harder to restore when disrupted.

Loss of Estuarine Processes. In intensively developed rivers, the problems tend to run downstream with (or often without) the water itself. Thus, the most significant effects of both pollution and flow deprivation are most apparent at the bottom of the system, where the freshwater meets the sea. Indeed, many of the great rivers of the world no longer reach the sea for much of the year. Or they are so altered that their estuaries-- one of the most biological productive resources on the planet--no longer

function. Examples include the mighty Nile, Zambezi, Yellow, Colorado, Eel, Rio Grande/Rio Bravo, Appalachia-Cola, Murray-Darling among them.

Floodplain Encroachment. Pervasively where we work, human settlements and farming within floodplains limits the potential for restoration of historically important riparian habitats. Such development often precludes the reoperation of upstream reservoirs to reintroduce managed flood regimes that reconnect the river to low-lying floodplains. And, as floodplains are developed, reservoirs must be operated more conservatively, reducing annual carry over storage and water supply potential. Even highly localized development at just a single point can preclude flow restoration actions on hundreds of miles of river. Ironically, when upstream dams are constructed and operated to reduce the frequency of flooding, human settlements tend to occupy the floodplain. Thus, reductions in the frequency and magnitude of large floods on many highly controlled rivers have actually increased the hazards of large floods and the associated economic losses. Such economic losses have risen dramatically over the last half-century even as the state and federal governments have invested billions in infrastructure to control flooding.

Climate Change. All of these problems, including the conflicts between human development, floods, and floodplain ecosystems, are certain to become much more difficult to manage in the face of greater volatility in precipitation and runoff patterns as a result of climate change. In many areas such as California, scientists predict that global warming will bring more intense winter rainfall and associated floods. Throughout the world, global warming will result in sea level rise and increased flooding of low-lying areas. Strategies for coping with supply insecurities without further depletion of the natural capital afforded by river systems is one of the greatest challenges facing water managers and river conservationists today.

Threats to Intact Systems. In a few precious places in the world, river basins that have so far escaped the frenzied development of the past six decades are facing imminent development and the last window to channel this development in ecologically responsible ways is fast closing. In our own backyard, a mere three percent of river mileage is currently protected under Wild and Scenic designation—a uniquely American conservation tool. Where rivers cannot be set aside from development, how can we be effective in confining development pressures on the relatively intact river system within their ecological tolerance limits? This is the challenge in river systems such as the Okavango River in southern Africa, the Pantanal in Brazil, the Mekong system in Southeast Asia, and the undammed rivers flowing off the Tibetan Plateau in Eastern Asia.

Socio-Economic Factors. There are also powerful socio-economic drivers behind water resource development, and the beneficiaries of the current management regime as well as government regulators are often reluctant to accept or advance

improvements in environmental performance because of costs, uncertainty as to outcomes, and lack of an effective political constituency for future benefits. Hydropower projects are less costly and more reliable than other renewable sources of electricity, such as wind turbines. Although significant, the economic benefits associated with fish, wildlife, wetlands, and flowing rivers accrue to disenfranchised communities such as the poor and future generations, or to the public at large. Perhaps the most perverse socio-economic factors driving unsustainable water resource development are financial subsidies and inaccessible planning processes; the former is universal, the latter most acute in developing countries where the NGO community does not often enjoy access or political power.

Institutional Dysfunctions. Enlightened efforts to pursue multipurpose management are often frustrated by the limited mandates--both geographically and functionally--of the numerous agencies charged with managing some aspect of water and associated biological resources. National governments or local districts have limited incentive to manage their project in a manner that will accrue benefits outside of their region. These institutional complications are often at their greatest where rivers traverse or define national boundaries, which is the case for 267 major rivers of the world. In the absence of effective and universal international norms and enforcement mechanisms, water extractions and flow alteration by the upstream riparians often export water scarcity and ecological damage to the downstream riparians. Flood control agencies usually have only peripheral concern for ramifications for water supply and ecosystem services. Water supply districts attempt to maximize reservoir storage despite increased flood risks. Fishery agencies are charged with protecting fish, but have little ability to control the flows of water upon which aquatic species depend. Similarly, other agencies or jurisdictions are charged with protecting water quality, licensing hydropower facilities, limiting stormwater discharges, permitting urban development etc. At best, these fractured jurisdictions generally result in sub-optimal management and at worst they perpetuate environmentally destructive, single purpose projects.

SOLUTION STRATEGIES AND TOOLS

Beyond preventing further deterioration, the imperative for the future is to incrementally restore these damaged systems to achieve a flow and sediment regime that resembles natural conditions to the greatest extent possible. While it is inevitable that water resources will continue to be developed to meet genuine and growing needs-- and both restoration and protection strategies must accommodate that reality--it is not inevitable that further development need come at the expense of aquatic ecosystems and the services that they provide.

How does NHI equip and position itself to address challenges of this scale, scope and complexity? In three words: strategically, resourcefully and incrementally.

Within California, NHI will address watershed restoration comprehensively from the headwaters in the Sierra to the terminal reservoirs (where the principal problems and opportunities are associated with hydropower development and rapid transformations of these landscapes) to the Central Valley and delta (where the problems and opportunities are associated with reversing the damage of the past intensive water engineering for agriculture and urban uses) to the coastal drainages and estuaries (where the problems and opportunities are associated with sediment loading from land disturbances and groundwater depletion).

At the national level, we will continue efforts to reoperate non-federal hydropower facilities through the FERC relicensing process. But we will also seize opportunities to work with the federal agencies that operate the major hydraulic infrastructure on concepts for reoperation to repair the ecological damage of the past. The near term targets include the U.S. Bureau of Reclamation and the U.S. Army Corps of Engineers.

Internationally, our focus will be on transboundary watersheds and on facility reoperation, with emphasis on the NAFTA borders (the Great Lakes and the binational watersheds with Mexico, including the Rio Grande/Rio Bravo and the Colorado River delta), Africa (southern and western), Latin America, and Asia. Much of this work will be conducted in association with local non-governmental organizations, universities, and bilateral and multilateral development assistance agencies.

ACTION AGENDA

1. ANALYTICAL TOOL BUILDING:

To restore degraded river systems, or identify the bounds of their tolerance to future development, it is necessary to understand and predict how water management alternatives will affect hydrologic, biologic and socio-economic elements throughout a river system. All of these water management challenges will be exacerbated by global climate change, and it is essential to be able to understand how changes in climate will be translated through hydrologic processes at work in a watershed into changes in streamflow and groundwater recharge and how these changes will impact the way in which water should be managed in the future for both environmental and human needs.

NHI's modeling team has acquired much experience with building and operating reconnaissance-level planning tools. However, we also have the capacity to integrate the continuum of hydrologic, hydraulic, water resource systems, biologic and socio-economic tools in ways that can illuminate the opportunities for optimizing water resource projects for environmental performance. However, our ability to build the analytic tools with the appropriate level of sophistication is often limited by the quality and quantity of data available. This is true even in the United States, and much more starkly in the developing countries in which we operate. Thus, resources and capacity to gather and process the types of data needed for analyzing water management alternatives must be a priority.

The areas where NHI will continue to build analytical capability include:

- *Understanding groundwater-surface water interactions*
- *Describing changes in watershed processes under alternative future climate scenarios.*
- *Understanding the dynamics that shape water use choices made by individual water users and water management organizations*
- *Relating changes in flow patterns in rivers and streams to changes in the biophysical condition of the resource.*

2. DEVELOPING ENVIRONMENTAL FLOW RECOMMENDATIONS

If we aim to restore biologically beneficial flow patterns, or keep such patterns from being disrupted in relatively undisturbed systems, we need to understand how alternations in natural flows affect various components of the water dependent ecosystems, and their processes and functions. We need this information as the bedrock of every project that we undertake at NHI, whether regulatory interventions, restoration projects or restoration transactions. For example:

- The Sierra Nevada streams are a biodiversity “hotspot” for aquatic invertebrates. These streams are also under increasing development threats. One possible conservation device is a Sierra water trust that would enter into market transactions to maintain flows in the amounts, locations and times needed to nourish invertebrate biota. But to do this artfully and successfully, we need to know the variable flow requirements of these species. This work has yet to be done.
- We know from previous work that it is possible to generate surplus water at existing reservoirs that can be deployed in flow patterns that will restore ecological functions in the downstream floodplain. But to reoperate these dams for that benefit, we need to know the magnitude, duration, frequency

and timing of the flows required to improve various components of the aquatic ecosystem.

- Today, federal agencies determine the operational patterns of hydropower dams by predicting the availability of aquatic habitat at any given flow level, but do not have the capability to estimate the likely biological response to changes in flows relative to other limiting factors. NHI needs to develop and utilize this capability in our hydropower licensing work.

3. RESTORING DAMAGED AQUATIC SYSTEMS

Since our inception, NHI has pursued a river restoration agenda along many tracks. NHI has also historically been a pioneer in crafting and demonstrating the feasibility of strategies to reoperate existing hydraulic infrastructure-- throughout the Central Valley of California--to augment water supplies and generate water for environmental flow releases. We will continue, expand and parlay these efforts in the following ways:

A. Restoring Environmental Flows at Hydropower Facilities

We will continue to negotiate environmental flow requirements in licensing and relicensing proceedings for non-federal hydropower projects, on behalf of conservation groups and public agencies, to replace minimum instream flow prescriptions with biological performance standards. Historically, we have participated in these proceedings to demonstrate the feasibility and merits of alternative operations and other restoration measures. Now, we will use our modeling capabilities to demonstrate how the restoration measures can also optimize the economic performance of the facilities. And, where feasible, we will position ourselves to play the role of the neutral expert – both in law and science – in future relicensing proceedings.

In the future, we will also pursue a parallel strategy with the U.S. Army Corps of Engineers and Bureau of Reclamation, which are legally required – but have classically failed – to periodically reconsider the operating plans for their dams to assure that the projects are operated in a manner that best accomplishes its purposes, including environmental performance.

Finally, we will participate in rulemaking proceedings to reform procedures for public participation in licensing and operational decisions by the Federal Energy Regulatory Commission.

In all of these efforts, we will pursue the fundamental principles that a project should be operated to optimize both environmental and economic benefits, and that its actual effects should be monitored in a manner that permits adaptive management if appropriate to achieve the intended benefits.

B. Developing Dam Reoperation Strategies at the Global Scale

We will explore the potential for applying a toolkit of innovative water management techniques to enable major dams all over the world to be reoperated to restore downstream ecosystems and human livelihoods. This work will include both a global survey of opportunities and also region-specific components in China, India, Southeast Asia, Brazil, Western Africa and Southern Africa. We will identify the best prospects and techniques for beneficial reoperation, advocate larger investments by the international development assistance agencies in performing operations modeling that will produce a detailed reoperation plan for each of these, and then persuade dam operators and their national governments to adopt the reoperation plans. The purpose is both to demonstrate the efficacy of dam reoperation in actual cases, but also to perfect an analytical methodology that can then be applied far more broadly to foster a worldwide dam reoperation movement.

C. Designing and Brokering Restoration Projects

We will devise and promote demonstration projects in California and globally to implement the concept of nesting environmental restoration within water supply augmentation schemes. Our larger purpose is to inculcate a new water resource management philosophy predicated on the belief that, while it may be inevitable that the water resources of the state and the world will continue to be developed to meet growing economic and consumptive needs, it is not inevitable that further development need come at the expense of aquatic ecosystems.

In California, the Great Lakes region, Australia, South Africa, and in a few other places in the world, a new paradigm is emerging in which major water projects – both infrastructure and transfers – are only likely to be economically and politically viable if they incorporate a net environmental restoration component. The converse also is likely to be true, that substantial new aquatic ecosystem restoration will probably only be accomplishable as a component of broader water supply enhancement schemes. To be sure, this new vision will be much more difficult to promote in countries where environmental amenities are still regarded as a luxury good. But the pace of adoption of this model will be influenced most by successful examples from those locales where we can stimulate successful demonstrations. That is one reason to continue the focus on water management innovations in California; there is a high potential to propagate successes from this great “learning laboratory” elsewhere in the United States and internationally.

For instance, by creating additional flexibility in how water is stored and released, it is possible to create opportunities for environmental restoration uses, including creating more natural flow patterns. The next step will be the development and implementation of actual, on the ground projects that will involve three components:

- (1) the reoperation of existing reservoirs,
- (2) in conjunction with groundwater banks
- (3) to enable restoration of more natural stream flows.

This work envisions devising and implementing the next generation of market transactions in environmental water rights. Beyond the creation and acquisition of instream flows, we will design transactions involving reservoir storage rights, groundwater banking rights, infrastructure reoperation rights, flood inundation rights, water transfers with an environmental component and a myriad of other devices, some of which now exist only in theory. For instance, riparian farmlands are often a choke point constraining the potential for seasonal inundation of floodplains to restore the dynamism of a river basin. It may be essential to obtain seasonal flood easements for these lands, not because of the inherent biodiversity value of those particular parcels, because they are the linchpin to restoring high biodiversity values in an entire river reach above or below them. While we do not intend to position NHI to hold such rights—a role more suitable for our partners such as The Nature Conservancy or the Trust for Public Land—our role will be to devise such transactions, find willing partners, broker the financing, foster a favorable regulatory climate, and, very importantly, design the necessary legal and institutional arrangements. This will require honing a new set of legal skills in which we have already established a track record. And it will require building economic assessment capabilities in resource valuation, benefit-cost calculation, and economic optimization.

Another graphic California example of essential water supply improvements opening the door to broad scale ecosystem improvements is found in the Sacramento-San Joaquin Delta. The delta is one of the most transformed landscapes in the world. Once, the largest wetlands complex in the western United States, it is today a vast mosaic of subsided islands devoted to a precarious agriculture walled off from the Pacific Ocean by earthen dikes that are vulnerable to catastrophic failure in the likely event of a major earthquake. The question is not whether but when the levees will fail. Even more remarkable, these delta levees comprise the water conveyance system at the hub of the Central Valley Project and State Water Project, which connects them to 22 million urban water users and an \$18 billion, irrigated agriculture industry. Stabilizing this system is urgent and indispensable. The only politically feasible method for doing so may be to rebuild the subsided landforms so that the levees become unnecessary, in effect growing brackish water

habitat instead of crops. The potential for parlaying this water supply imperative into a vast wetland restoration opportunity has been the central focus of NHI's delta islands "learning laboratory" project for several years. In the next phase, we will focus particular attention on the rebuilding and restoration of Sherman and Jersey Islands, the westernmost islands on whose integrity the fate of the entire delta depends. We have designed this work with the Department of Water Resources and will now implement it with both governmental and non-governmental partners.

There are three other legal strategies that NHI will pursue to advance these water management innovations:

D. Integrating Groundwater Regulation into The Surface Water Administration System in California

The next generation of water management innovations in California will often entail integration of surface and groundwater management. Reservoir reoperation in conjunction with groundwater banking is one example. This integration is problematic under the current state of the law. California, like most western states, maintains a legal fiction in treating groundwater and surface water as two distinct resources, subject to two different and incompatible sets of rules governing ownership rights, limits on extractions, and environmental protection. In general, surface water is treated as a public resource, subject to allocation and regulation by state government, whereas groundwater is treated as the private property of overlying landowners, and is subject to exploitation free of state interference. In actual hydrologic fact, groundwater and surface water are usually NOT separate resources, but are inextricably linked. This reality has very important consequences for aquatic biodiversity because excessive extractions of groundwater, particularly in close proximity to surface streams, tend to deplete the baseflows of these rivers. This is a large and growing problem in arid regions with intensive groundwater development because the streamflows tend to be quite variable and subject to periodic droughts. Thus, depletion of baseflows can irreversibly alter delicate riparian ecosystems and eliminate the refugia for rare and endangered aquatic species. Recent scholarly analysis now suggests that the State Water Board's jurisdiction is sufficiently broad to allow it to curtail groundwater pumping that is adversely affecting flow-dependent environmental assets. However, the State Board has declined to apply that reasoning. To force this issue, NHI is exploring bringing a test case, ultimately before the California Supreme Court to attempt to integrate tributary groundwater into the existing surface rights administration system.

E. Defending the Endangered Species Act

The Federal and State Endangered Species protections are perhaps the greatest legal constraint on water supply systems. There is a growing realization that these

systems can never be secure as long as these species remain at risk. This realization is an essential inducement to water supply agencies to incorporate environmental restoration components into their schemes. However, the application of the federal Endangered Species Act to prevent impoundments and diversions that jeopardize aquatic species at risk of extinction is everywhere under assault by water rights holders claiming that any consequent reduction in their water supplies requires compensation from the state or federal governments. Such a requirement would often make use of the ESA both uneconomic and impolitic. NHI has represented environmental interests in one landmark case defending the Endangered Species Act and will now extend this legal expertise to other future cases.

F. Policing Unlawful Water Diversions

Most new diversions in the Central Coast and possibly other regions with growing agricultural demand occur illegally. The diverters, who do not have existing rights adequate to cover the diversions, do not file permit applications. The State Board, which is aware of this pattern and practice, has been unwilling to correct it. The State Board now takes ten or more years to process new water rights applications in the Central Coast and possibly other regions. This pace encourages illegal diversions: who can wait ten years to develop an individual property? However, the State Board rarely investigates such illegal diversions and, when it does, simply orders the diverters to file permit applications without assessing any penalties. In response, NHI will bring test cases to challenge the pattern of non-enforcement on a regional basis. We will advocate that an adequate enforcement program is necessary for recovery of species listed as endangered under federal and state law.

4. PROTECTING AND RESTORING FLOODPLAIN AND DELTA ECOSYSTEMS

All of the foregoing river restoration opportunities are being increasingly hampered by floodplain and watershed development. Impoundments, levees, dikes, diversions and other engineering works in intensively developed river systems convert naturally dynamic floodplains, estuaries and deltas into static and unproductive systems. Taming the natural variability in flow patterns not only isolates these formerly productive systems from the rivers that nourish them, it also invites land use encroachments that severely limit the potential for eventual restoration. The San Francisco Bay-Delta is a classic example. Here, storage dams and an extensive system of levees have converted what was once the largest and most productive wetland complex west of the Mississippi into a precarious patchwork of farmlands and a highly vulnerable water supply conveyance system. Everywhere on the planet, flood control infrastructure has attracted human settlements and agriculture, creating private property rights that would be impinged

by reintroducing controlled flood regimes for environmental restoration purposes. If we are to be serious about pursuing a restoration agenda, we must be equally serious about preventing and managing these preclusive land developments.

It is possible to accommodate both the needs for economic development and floodplain ecosystems. By setting development back from the floodplain, it is possible to allow moderate floods to inundate the floodplain and rejuvenate the floodplain ecosystem on regular basis without economic damages. Managing flood control and water supply reservoirs to release moderate, beneficial floods on a more frequent basis, can actually reduce the risk of large harmful floods. NHI will expand our work--locally and globally – by pursuing two strategies to control floodplain development that we have already demonstrated in the Central Valley and Bay-Delta system:

A. Reform of the Central Valley Flood Control System

The State, through the Department of Water Resources, is now undertaking a systematic review of the Central Valley flood control system, in order to respond to the 2001 and 2004 cases that held the State liable for failure in flood control design or maintenance. The potential liability runs into the tens of billions of dollars as a result of inadequate design and deferred maintenance of a system largely constructed more than fifty years ago. This review, which will occur over the next several years, is an unprecedented opportunity to reshape the flood control system, including (A) improved funding for redesign and maintenance, (B) better integration of environmental restoration, and (C) stricter accountability for any permitting decision that allows development in the face of disclosed risks to life and properties. Through advocacy before DWR and the State Legislature, we will seek to include the following strategies in any comprehensive plan and otherwise implement them.

- *Shape local planning guidelines* Of these objectives, the most cost effective and time sensitive is limiting further urbanization of floodplains. In California and much of the United States, decisions about land development are made primarily at the local level and by the landowners themselves. Federal or state agencies can discourage development by refusing flood insurance or protecting wetlands, which are common in low lying areas, but local landowners can often circumvent these obstacles to development by self-financing local levees or mitigating for wetland loss. Local jurisdictions generally must comply with zoning plans and environmental impact assessment processes in approving applications for new development. Local development proposals can be redirected by contesting the compliance with these plans and processes, but this is extremely time-consuming and resource intensive. Shaping county and city general plans is a more efficient way to

steer development away from low-lying floodplains and can improve the chances of successfully contesting particularly destructive local projects subsequently proposed by private developers. In effect, we will participate in the local planning processes to advocate for full disclosure of the residual risks to life and properties as the basis for permitting any further development. Such disclosure (and the liability associated with permitting development in the face of the disclosed risk) would tend to relocate development into upland areas.

- *Conservation Easements.* The development of even a small area in a floodplain can greatly restrain or preclude flow restoration through many miles of river. Conservation easements are one device for preventing such restoration constraints, but require large amounts of funding and the cooperation of the riparian landowners. NHI will add unique value to the work of the land conservation organizations trusts that acquire such easements by identifying the critical flood easement acquisitions necessary to maintain restoration and water management options. Specifically, NHI will determine the location, area, and distribution of high-risk flood easement acquisitions in the Sacramento-San Joaquin Delta and along the lower Sacramento and San Joaquin Rivers. NHI will also collaborate with other environmental organizations to promote private and government funding for conservation easements targeted for low-lying flood prone lands.
- *Remove or setback levees that prevent inundation of flood plains, secondary channels, terminal wetlands, or freshwater tidal wetlands.* NHI is currently pursuing this objective with our Dutch Slough restoration project in the Delta and restoration of the lower Guadalupe River in heart of Silicon Valley. We will expand this type of activity in the future.
- *Promote the development and use of flood bypasses and ring levees to allow beneficial flooding without creating a hazard for human settlements.* NHI has advanced this objective with our work in the Yolo Bypass and the Guadalupe River.
- *Regrade channels and floodplains to recreate smaller scale floodplains compatible with economic realities such as acute demand for water or urban encroachment along a flood control channel.* NHI is pursuing this work on Marsh Creek and the Trinity River and has supported efforts to pursue larger scale efforts on the Tuolumne and Merced Rivers.
- *Research and Education.* The manner in which floodplain development precludes future management options in any given watershed is poorly understood and usually under appreciated. NHI will specifically address these questions in every river basin it analyzes and seek to educate water

users and other stakeholders who will be negatively impacted by local development decisions.

B. Enforcement of the “Public Trust” in Floodplains

California and some other states hold fee title ownership to lands below the mean low water level and a public trust easement on all lands below the mean ordinary high water level. States’ property rights in these lands are based on the natural hydrologic conditions that existed when the state was admitted to the union. Because reservoirs and other flood management strategies have greatly reduced the volume and aerial extent of the mean high water area of the floodplain, large areas that are seldom inundated may actually lie within the states’ public trust easement. Enforcement of this easement for the purpose of river basin management could therefore preclude the environmentally harmful development of low-lying floodplains. However, the public trust doctrine – which the Mono Lake Cases applied to limit direct impacts – has generally proven ineffective to date as applied to cumulative impacts. In response, NHI will bring test cases seeking to motivate or, if necessary, compel the State to undertake timely, coordinated and effective regulation of these trust resources on a regional basis.

5. NEGOTIATING TRANSBOUNDARY & INTEGRATED WATER RESOURCES MANAGEMENT PLANS

NHI seeks to be at the negotiation table and on the ground in order to influence change. Sometimes, most often in the developing world and in the transboundary context, there is no negotiation table at which to sit, either for organizations like NHI or for the resource users who live and work in the basins. “Integrated water resources management” (IWRM) is a process of bringing all of the interested parties and decision-makers to the negotiating table and guiding deliberations towards an informed understanding of the optimal water management choices. In many settings around the world, water policy has been reformed to require the kind of broadly subscribed water management dialogue envisioned by IWRM. Brazil and Mexico, for example, have new water laws that call for the creation of river basin management associations. South Africa also has created water management processes that include consideration of the water needs of disadvantaged communities and aquatic ecosystems. In transboundary settings there are an increasing number of international river basin commissions in existence that seek to transcend the upstream-downstream tensions that exists in many river basins by creating a forum for deliberation and negotiation of joint management arrangements.

In recent years NHI has gained significant experience in instituting the IWRM framework in the Okavango River Basin, which traverses three nations in Southern Africa, and in its U.S.-Mexico border water work on the Rio Grande/Rio Bravo system. We are now beginning similar work in the Great Lakes basin. In these cases, NHI creates shared databases and advanced analytical tools to inform understanding of optimal outcomes. We also identify and assess the range of plausible and promising future management scenarios and design the legal and institutional frameworks necessary to implement innovative solutions.

Strategically, the challenge for NHI is to identify areas where our contributions to IWRM processes are likely to be welcomed. NHI has begun to establish extensive contacts in the water management communities in Southern Africa, West Africa, China, Mexico and Canada. We will continue to build these networks to gain access to promising river basin planning processes such as OKACOM (Okavango River) and ZAMCOM (Zambezi River) in Southern Africa and OMVS (Senegal River) in West Africa. In addition we will transfer our experience to regions where there is a stated desire to implement IWRM principles, such as Brazil and where vital aquatic ecosystems are threatened. This is how NHI's valuable experience in the Okavango River Basin was initiated. It will be largely through our strengthening network with international and regional water management experts and organizations (e.g. the Stockholm Environment Institute, the International Water Management Institute) that will provide entry points for NHI to promote, organize and advance IWRM processes.

GROWTH TARGETS FOR THE NEXT FIVE YEARS

NHI has accomplished much in the last fifteen years, and we look forward to moving forward with sound strategies to accomplish even more in the next five years. To write a new chapter in the life of our organization, we will need to build additional capacities, "customers", working partnerships, links to decision-makers, and funders.

Building Additional Internal Capacity

Economics: In addition to adding project staff as demands increase, NHI will seek to deliberately diversify its internal capabilities to meet the challenges of this Strategic Plan. As this Plan contemplates, we will more routinely incorporate economic dimensions in our work. While we have utilized external economic consultants in the past, we will add additional economics capability to the staff and the board.

Freshwater hydroecology: The link between hydrologic patterns and ecological requirements is central to most of the strategies discussed in this plan. NHI will also build this capability in the staff and board.

International (transboundary) legal and institutional capacity:

Transboundary water resource management has been one of the most fertile areas of international law development, in the form of bilateral and multilateral management accords and treaties. Increasingly, international commercial law governing transboundary transfers of water will also bear on management arrangements. Moreover, improvements in domestic water resources laws and management institutions are often a requisite to achieve the physical improvements for which our projects aim. To a certain extent, the legal and institutional design and reform activities will require specialized local expertise. But replicable lessons and management models require a more overarching expertise. NHI possesses such expertise in abundance on California laws and institutions, which may provide such lessons and models, but we should seek to develop a more global capability as we expand our work in this area. This expansion should also include building working relationships with the legal and institutional experts in the international development agencies that engage in legal and institutional design work, such as the World Bank, the Food and Agriculture Organization, the United Nations Development Programme, the World Conservation Union, World Wildlife Fund, and others.

Media relations: Another competence that will build for the future is media relations. Our work is intended not only to solve immediate problems, but also to create momentum for further application of the techniques we are authoring. In the past, we have been remiss in not publicizing our products and successes as much as they merit and in ways that will foster their propagation. Lack of budgets for this function and lack of experience in working the media are the principal reasons. We shall remedy this in the future by routinely building into project budgets an allowance for media outreach and by recruiting a new staff member who has the experience to guide our efforts.

Expanding Our “Customer Base”:

NHI is not a law or consulting firm in the classic mold of providing services to customers on request in order to generate a fee. While we are receptive to project concepts initiated by others that advance our mission and strategies, we typically conceive, design, organize and fund projects on our own initiative. Within that

model, however, we generally execute our projects in collaboration with other organizations that are variously clients, partners, collaborators or “customers” Historically, the prime audience for NHI’s analytical work and policy recommendations include:

- Government regulators, managers and decision makers, including water project operators, water rights administrators, legislatures and judicial tribunals;
- Private sector custodians and water rights holders;
- Private foundations and official aid agencies who mobilize financial resources to address water resource issues;
- Civil society groups, including environmental and community development organizations, and research institutions that seek to influence official policies.

Within our established model, in the future, NHI will expand this base to include:

- **Legislative bodies.** In the past, NHI has often served as advisors to high-level government water managers and regulators. These relations have served our objectives well, by giving a voice in the inner circles of decision-making. By contrast, our influence on the legislative branch—at both the federal and state level—has been relatively scant. Yet, the law making bodies are often the crucibles for the most spectacular leaps in resource management policy. Yet, as noted, NHI is not well positioned to act as a legislative advocate, because we do not represent a membership with electoral clout. A more appropriate niche for us in the legislative arena to serve as expert consultants to natural resource committees in the U.S. Congress and the California legislature. We have not hitherto explored the promise and pitfalls. It is time we do so.
- **U.S. Federal agencies.** NHI has a long-standing history of working with the Department of Interior (particularly the U.S. Bureau of Reclamation and Fish and Wildlife Service), the Environmental Protection Agency, NOAA Fisheries and the Department of State. Other agencies with a water resources agenda that are logical targets for developing closer working relationships include the U.S. Army Corps of Engineers, Federal Emergency Management Agency, Department of Energy, and the Department of Agriculture (and its Resource Conservation Service).

- **Development assistance agencies:** The development assistance agencies with a water resource portfolio have the means and reach to influence development and conservation decisions by national governments in regions of the world where NHI intends to work. We have limited experience working with, or under funding by, USAID, the World Bank and the Global Environmental Facility. However, our potential to influence policies and attract funding from these entities, and the broader constellation of regional development banks and bilateral aid agencies is far larger than we have yet explored or pursued. As we expand our international involvement, these are prime targets for developing productive working relationships, particularly as advisors, collaborators and grantees rather than as contractors.
- **Commercial enterprises** engaged in providing environmental services such as renewable energy companies and mitigation banks where consistent with our tax-exempt status as a “public interest law firm”.

Building Strategic Alliances:

Increasingly we are finding that our strategic path lies along a route that is so compatible with some of our consistent partners that a more structured, synergistic and enduring relationship makes more sense than an *ad hoc* relationship. Our work with the Sustainable Waters program of the Nature Conservancy and with the Stockholm Environment Institute are examples of relationships where we actively seek to advance the agenda of our partners as they do ours. In the future we will explore the advantages of formalizing these and other similar relationships as long-term strategic alliances with joint planning, fundraising and project execution agreements.

Building a More Consistent Presence At The Seat Of Government:

Quintessentially, NHI’s business is to shape and influence the actions of public officials and private sector custodians who manage and regulate water resources. These officials, and the trade associations that represent the water developers and consumers, are primarily located in the national and state capitals. This is frequently where the funding decisions are made on government grants and contracts. NHI has a presence in Sacramento and Washington. But the current staffing in Sacramento consists of our cadre of scientific analysts, who do not engage in the policy circles. Our presence in Washington consists of occasional and sporadic visits by NHI’s senior staff. We can be more effective as an organization by building a more consistent presence in the state and federal capitals. That means preferentially growing the organization in Sacramento and Washington.

In the near term, when NHI recruits new staff that will work on policy matters, we should locate those staff in Sacramento rather than in San Francisco. If we add staff in the Nevada City or Alaska offices, it should be for region-specific activities that require a local presence. To enlarge our presence in Washington, NHI's president is committed to establishing a more routine and consistent schedule of visits with time allocated for interaction with policy officials to explore new project activity consistent with this Strategic Plan.

Expanding the Funding Base:

Traditionally, NHI has sought funding from private foundations, government grants, and fee for service arrangements with other non-profits and public institutions. We have not engaged in direct mail solicitations or individual philanthropy. One potential advantage of tightening our strategic focus is acquiring a more distinctive identity or personality that will enable us to cultivate individual donors, just as do most non-profit natural resource conservation organizations. This would give us the unaccustomed luxury of generating "uncommitted funds", not tied to a specific project. While no decision has yet been made in that regard, we shall explore that potential as part of our business plan for the future.