Lake Tahoe TMDL Implementation in Douglas County

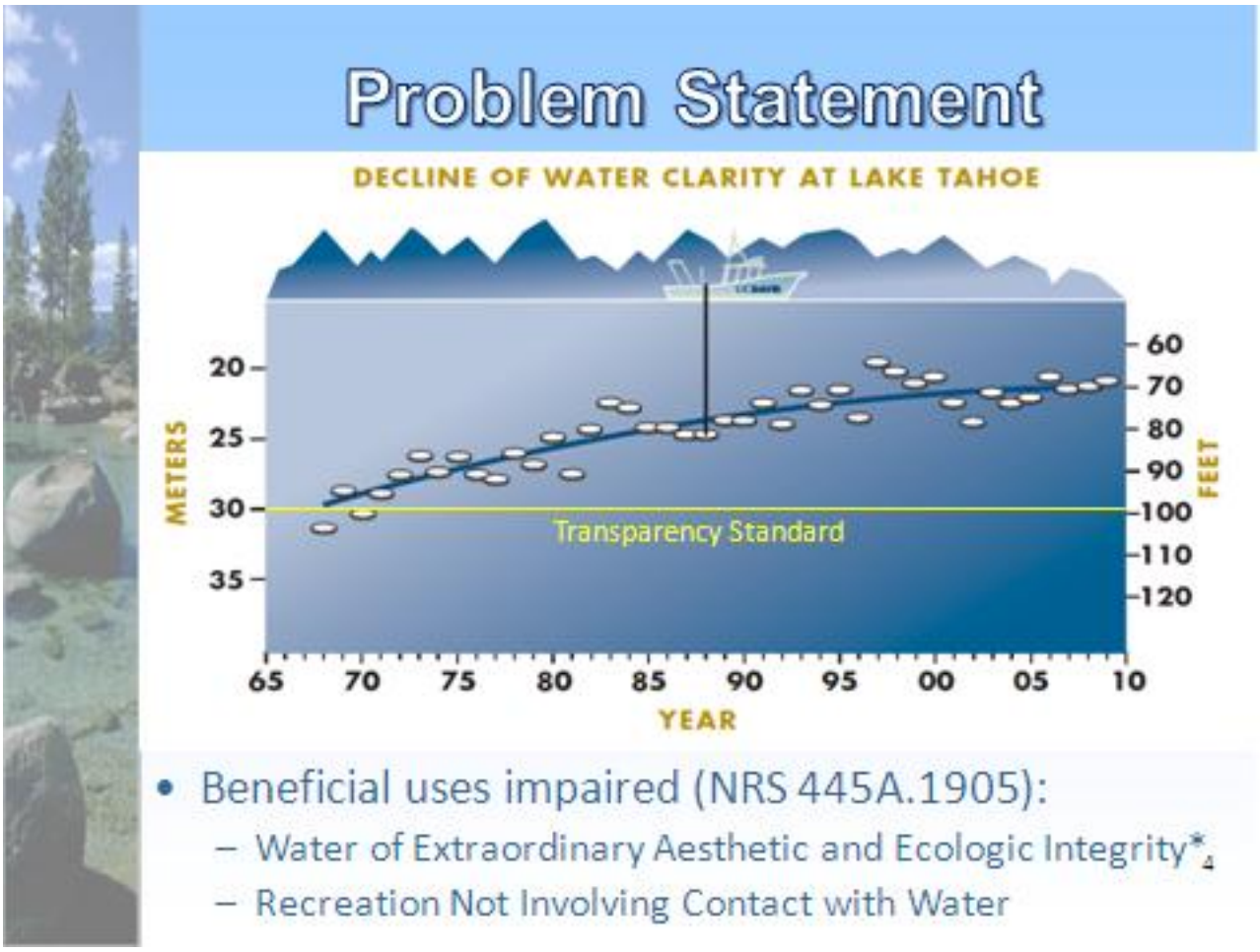
3/15/2011

Outline

- Background & Problem Statement
- Lake Tahoe TMDL Overview
- NDEP Regulatory Approach
  - Agreement Approach
  - Stormwater Load Reduction Plans
  - Lake Clarity Crediting Program
- Next Steps and Expectations
- Douglas County Current & Upcoming Efforts

Background - CWA

- Clean Water Act requires:
  - Beneficial uses for all water bodies
  - Water quality standards (WQS) to protect beneficial uses
  - Monitoring and assessment
  -



The standard that we are striving to achieve is approximately 100 feet annual average secchi disk depth of clarity.

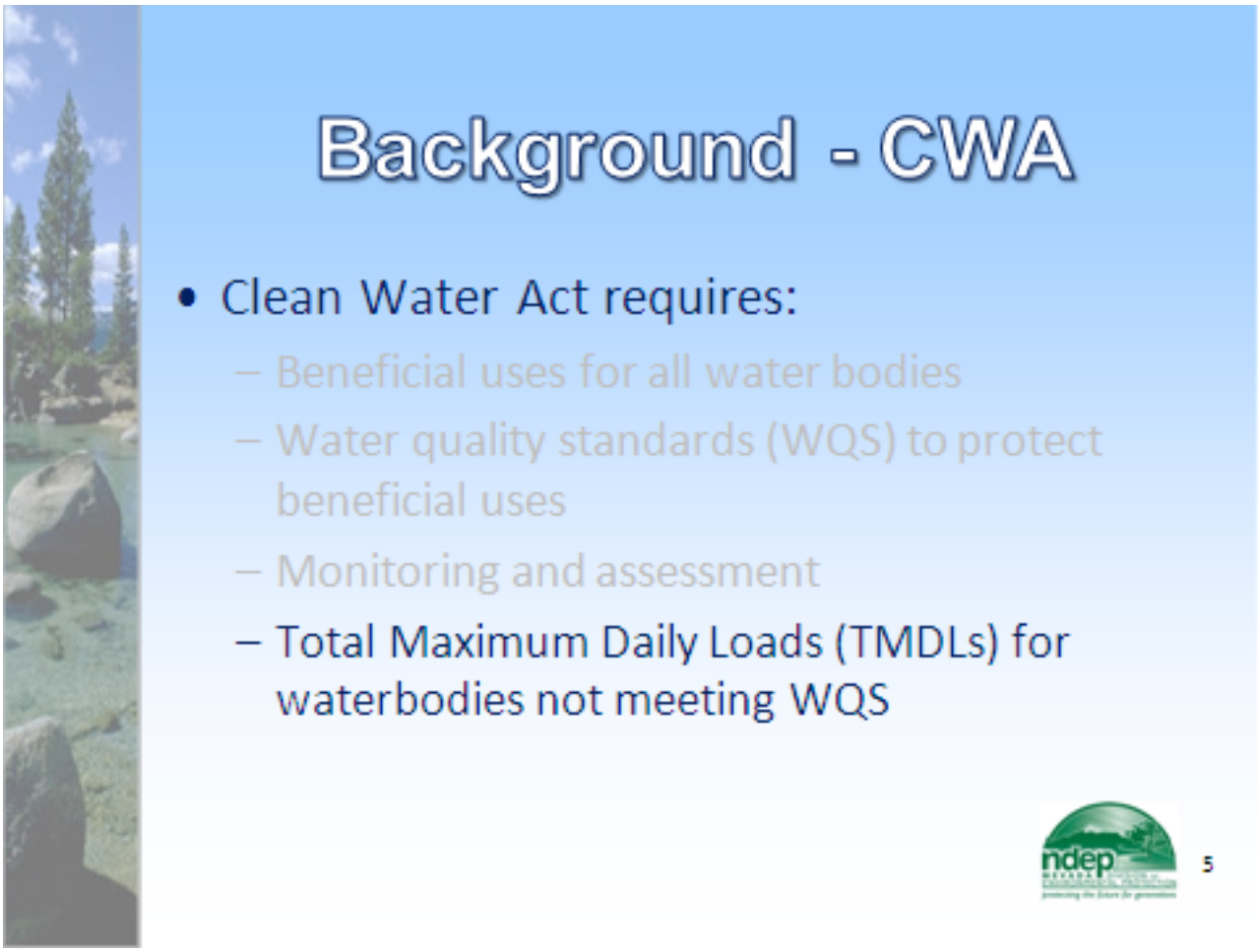
For purposes of this presentation, transparency is synonymous with clarity.

Secchi disk depth is the depth a 20 cm (8”) white disc lowered into the water column is visible to the naked eye. The average annual is the average of all measurements over the course of a calendar year.

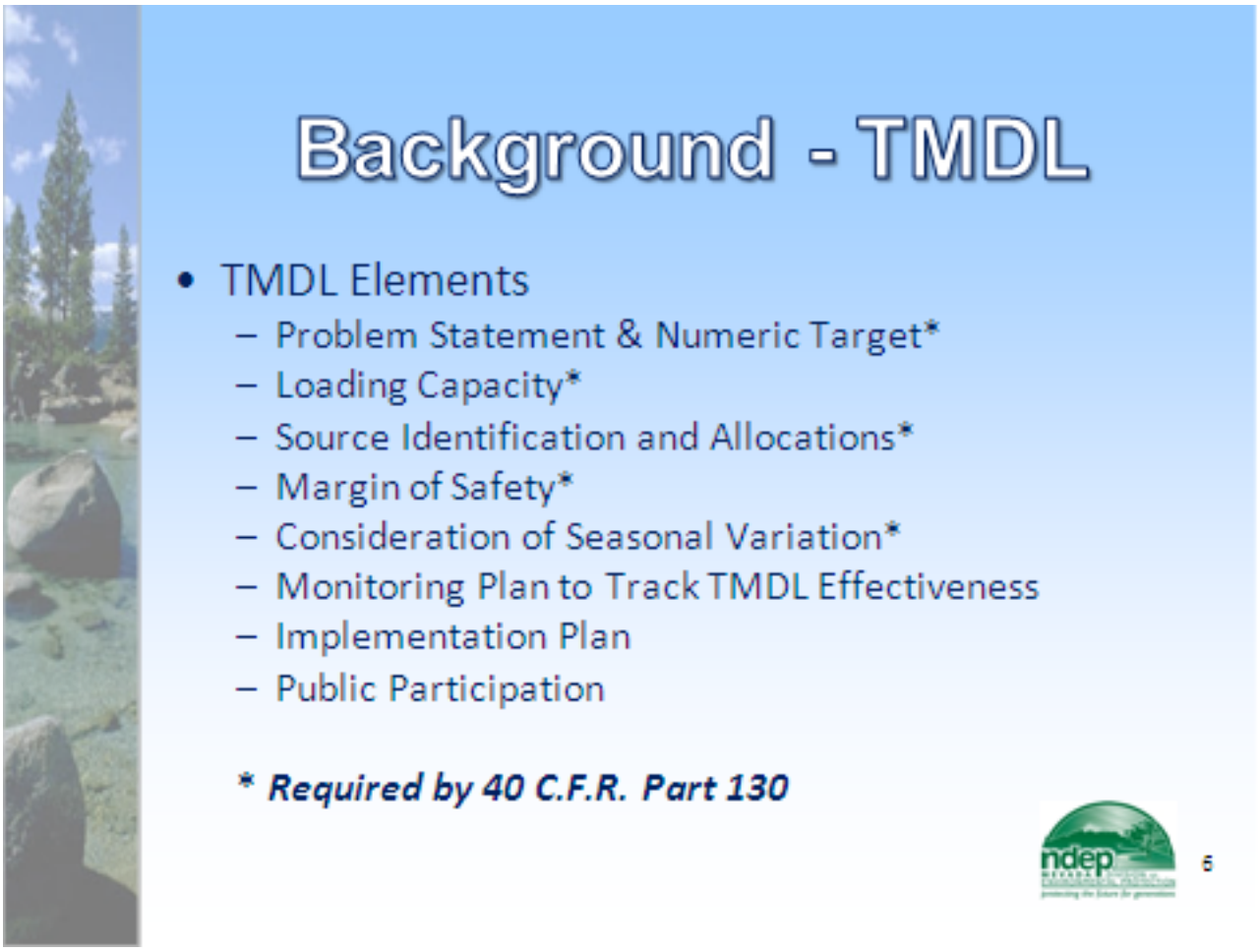
Monitoring data conducted by UCD (measured every 7-10 days since 1968) has shown a progressive decline in transparency of Lake Tahoe.

*Lake Tahoe is the only waterbody in Nevada to have this special designation

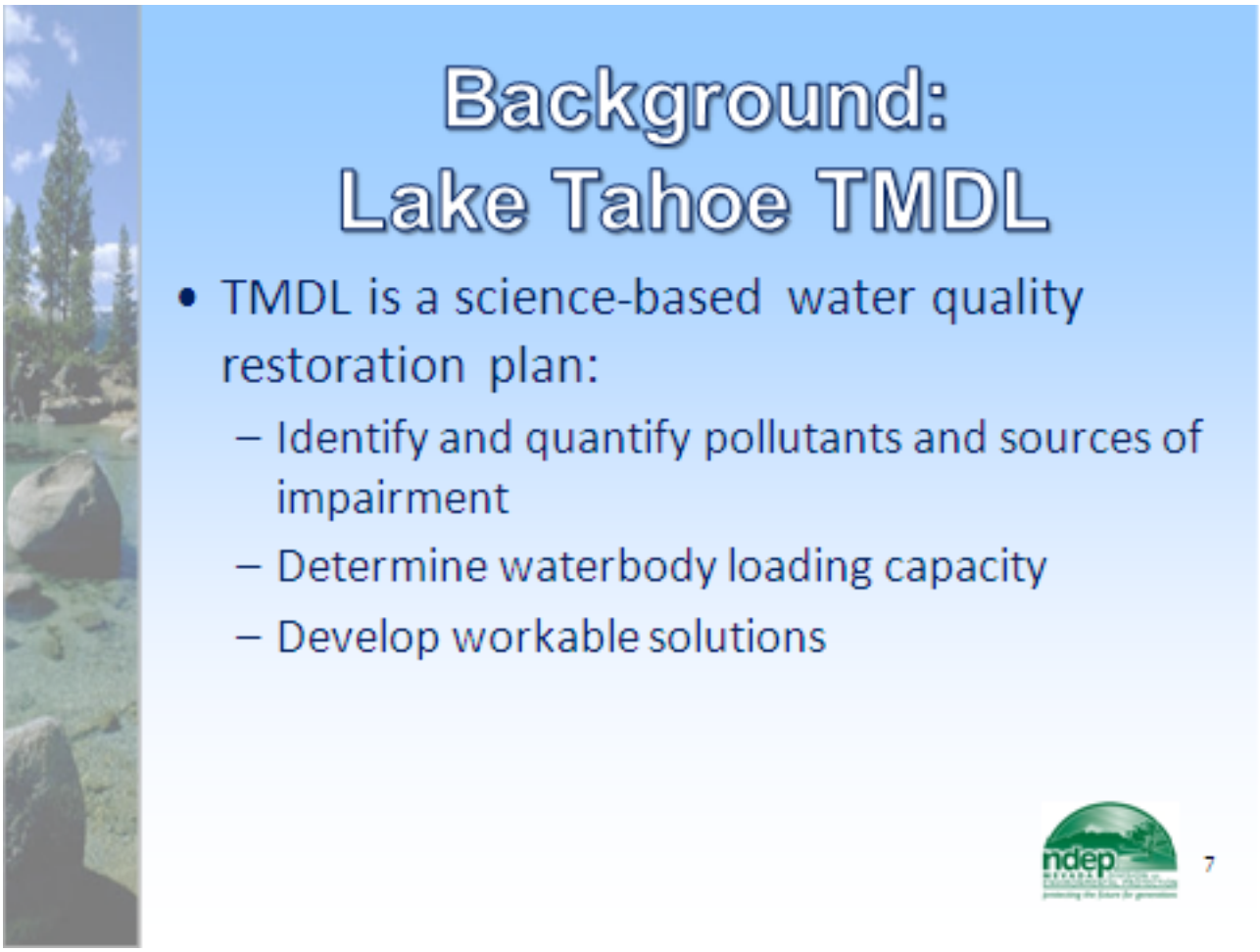
Lake Tahoe is also an Outstanding National Resource Water, which by federal anti-degradation policy, prohibits long-term degradation to water quality.



Across the nation, TMDLs typically are simply a calculation of the maximum amount of a pollutant a waterbody can receive and still safely meet WQS.



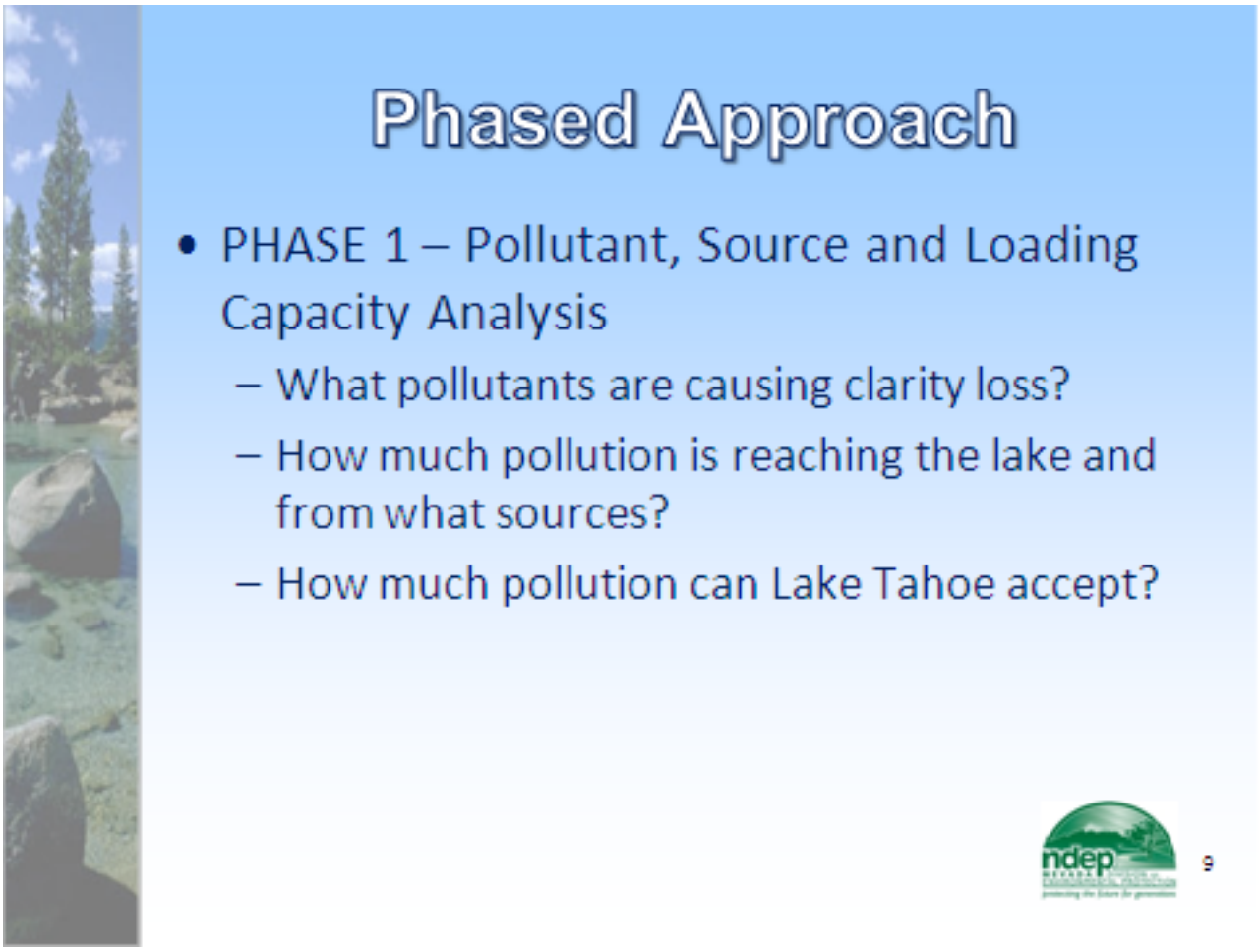
The intent of this slide is to illustrate that TMDL development is a process. And there are specific elements and components that EPA needs to see in order to approve it (marked with asteriks). Those not marked such as the implementation plan that are not required.



Given the national significance of Lake Tahoe, a typical TMDL is not appropriate.
This is the first TMDL in Nevada for which an implementation plan has been developed.

Lake Tahoe TMDL is a multi-million dollar effort (over $10M to date) of national significance that has involved more than 150 individuals: scientists, resource professionals, multiple agencies, stakeholders and the public.

From the beginning we wanted the outcome of the TMDL process to be a plan of implementation that received broad stakeholder support. And because science facilitates understanding and people are more willing to accept things that they understand, we wanted the TMDL and resulting policy to be based on the best available science. Therefore, we built an extensive TMDL science plan as well as peer review and public and stakeholder outreach processes.



The TMDL agencies used a phased approach involving three distinct phases of TMDL development. Key questions were developed for each of the phases.

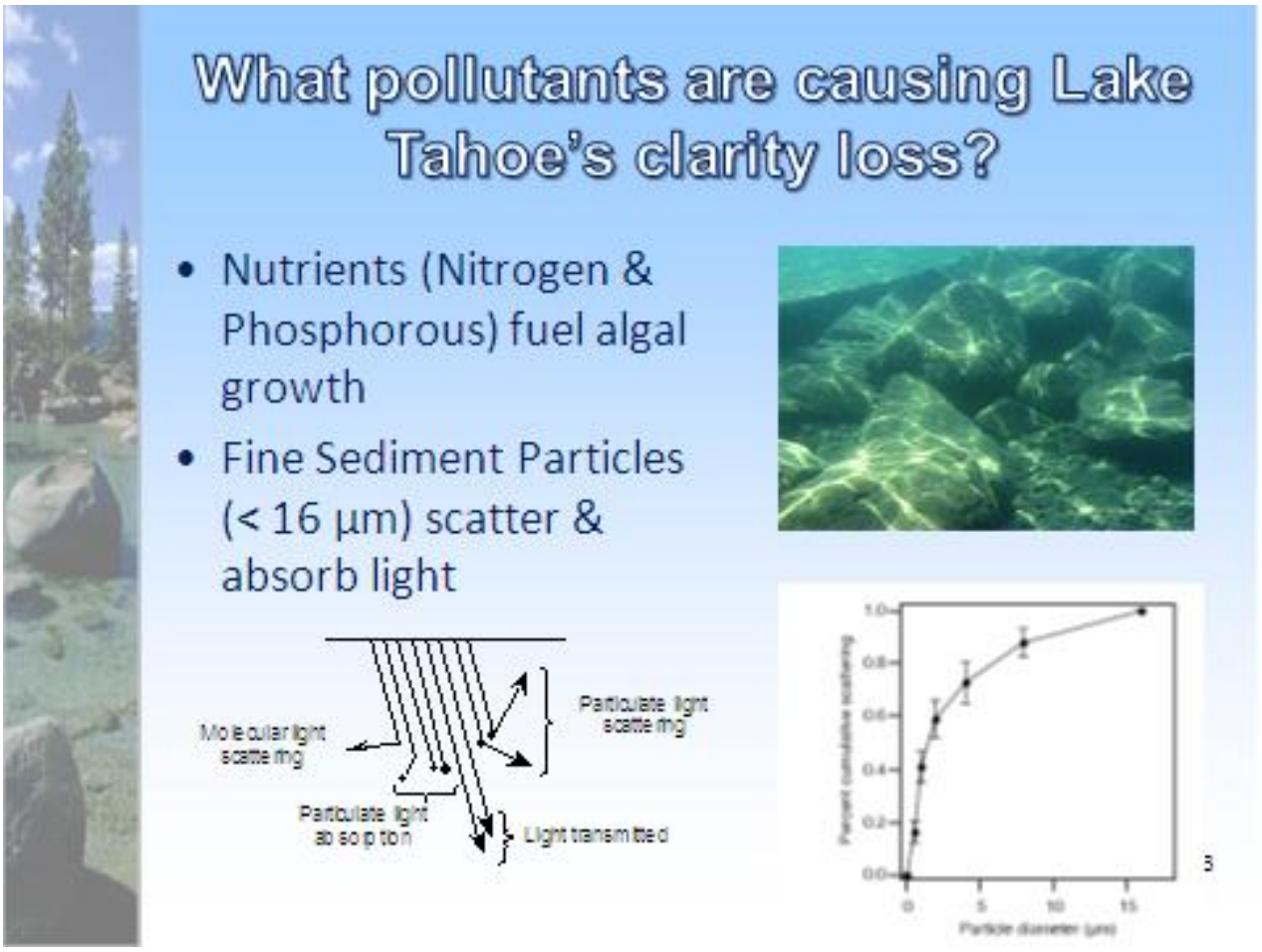
Phased Approach

- PHASE 2 – Load Reduction Analysis & Restoration Planning
  - How should we go about restoring Lake Clarity?

Phased Approach

- PHASE 3 – Implementation, Assessment of Progress and Adaptive Management
  - How will the strategy be implemented and who will implement it?
  - How will progress be assessed?

PHASE 1
Pollutant, Source and Loading Capacity Analysis



Prior to the TMDL, scientists understood the importance of nutrients in controlling clarity;

N & P fuel algal growth which prevents light penetration into the water column;

this is the primary reason why sewage was exported from the basin.

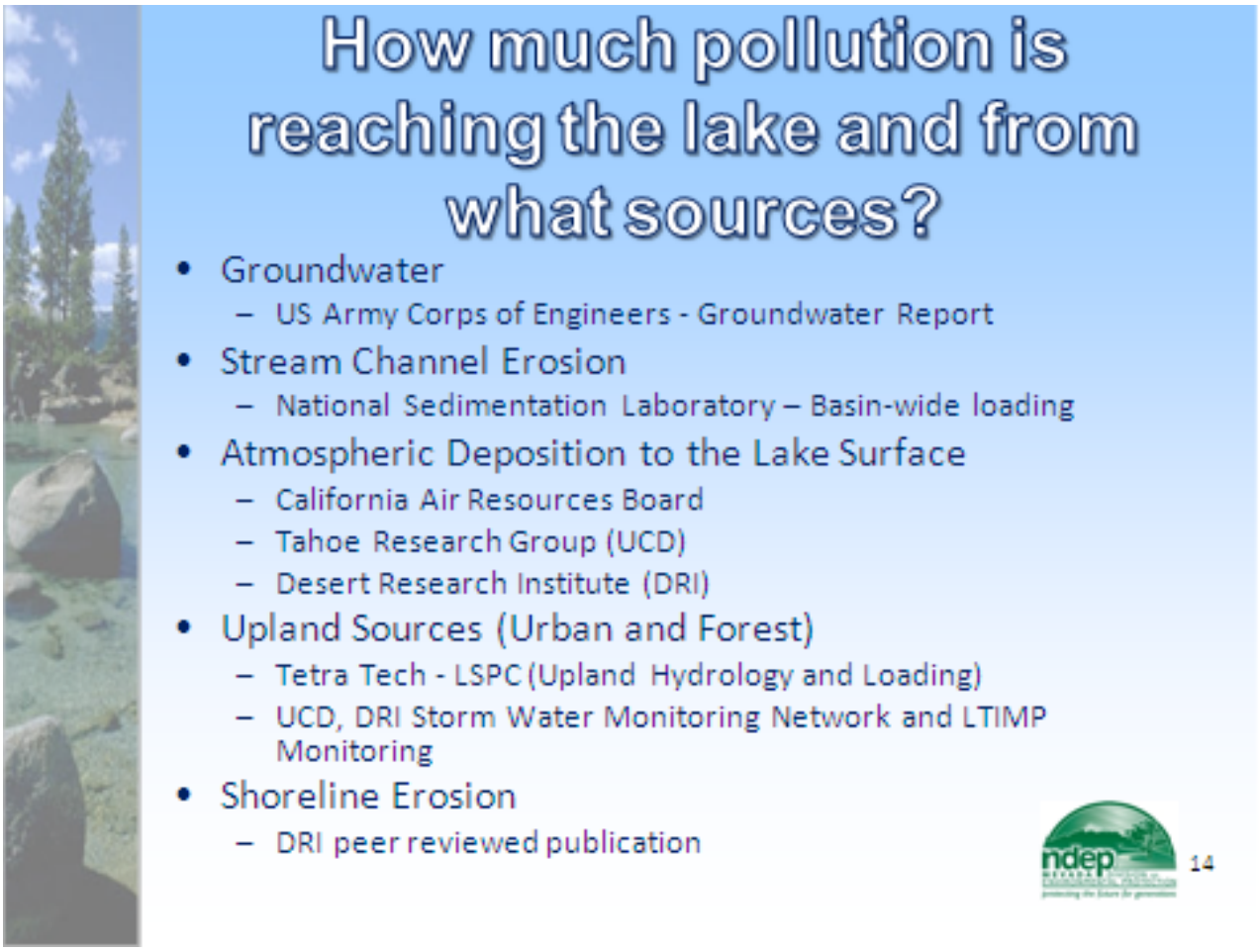
However, what was not well understood was the role that sediment plays in controlling clarity.

Sediment not only absorbs light, but acts to scatter it as well; so it also reduces light penetration.

Obviously, the more sediment particles the cloudier the water. However, particle size is also of key importance: the smaller the particle, the greater the effect of scattering.

It is the tiniest particles that scatter light the most. The sediment size of concern for the TMDL is FSP < 16µm. Due to their size, these particles do not readily settle out of the water column.

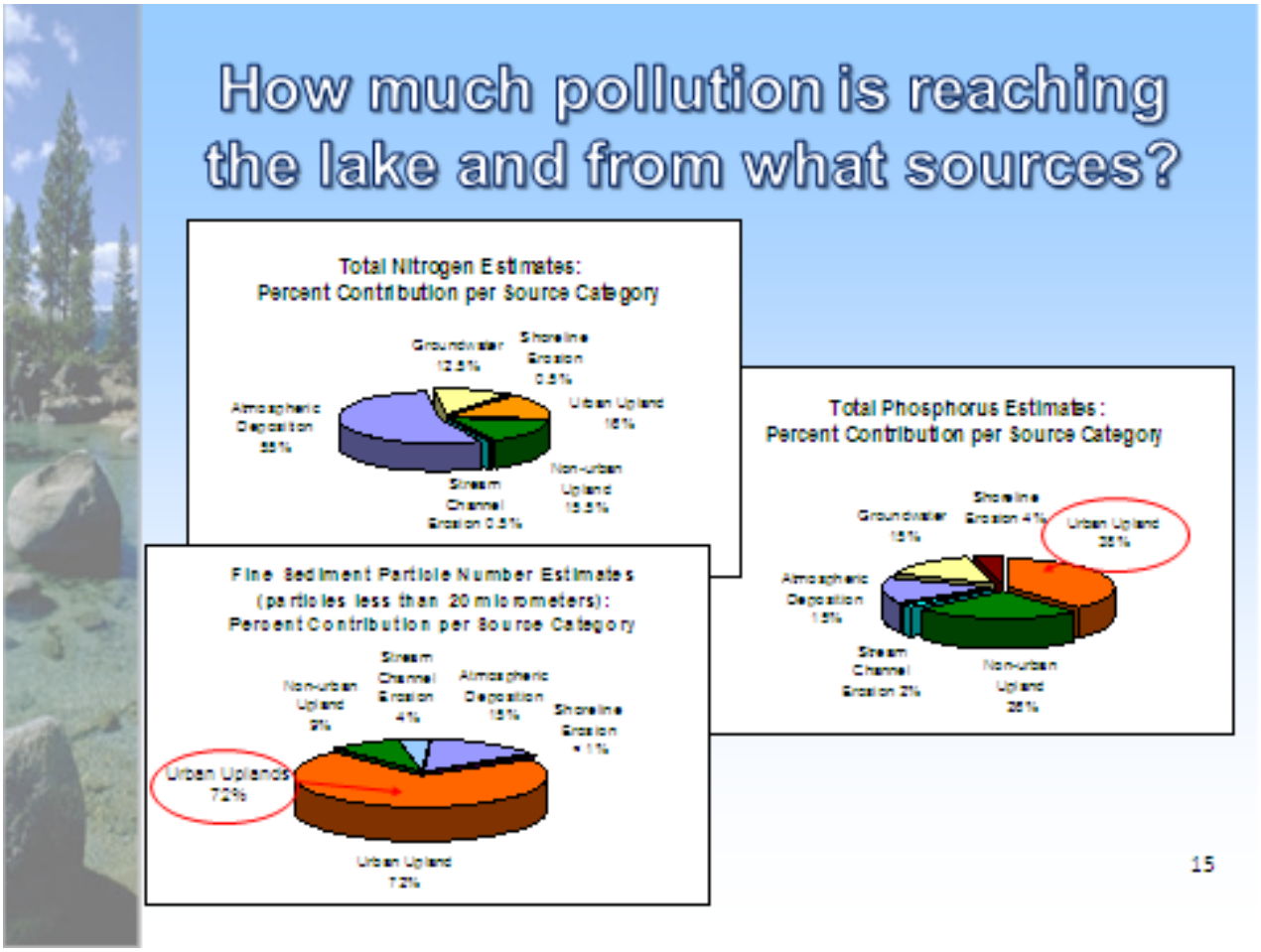
The relative importance of nutrients and FSP will be discussed in a few slides…



Although the Tahoe basin historically has a lot of data and information, approximately $4 million was dedicated to TMDL science (ie., monitoring and research) to cover gaps in order to quantify estimates of pollutant load delivery rates from the 5 major sources. This effort included national and local experts in each field. The result was that the Lake Tahoe TMDL is built upon a substantial amount of local information such that it is considered one of, if not the, premier TMDLs in the country.

To estimate loading from upland source categories, the Lake Tahoe Watershed Model was developed. This is a customized application of the EPA approved LSPC watershed modeling system; the model is designed to simulate watershed hydrologic transport and water quality processes; calibrated using local data sets: TMDL SW monitoring project and LTIMP data.

Please note urban upland is the same as urban stormwater or stormwater runoff from the urbanized areas.

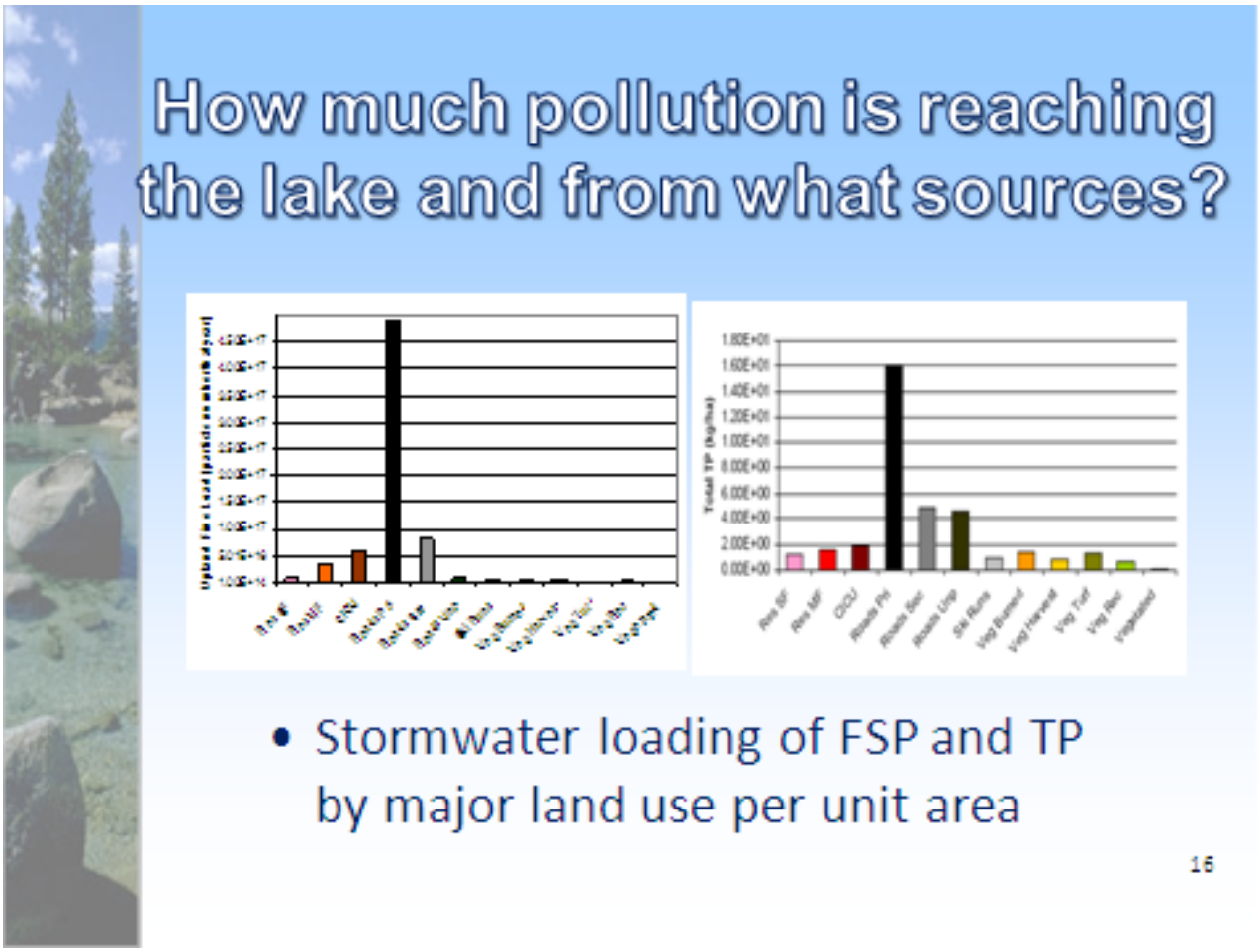


A previous nutrient budget for Lake Tahoe existed. The TMDL results agreed rather well with previous estimates, but refined and made them more reliable.

One of the greatest accomplishments of the TMDL was to develop a FSP loading budget to the lake – this had not previously been done before.

The key result from the loading analysis is that the bulk of the fine sediment particles & the phosphorus (which is associated with sediment) is from urban stormwater runoff. Although urbanized land uses make up only 20% of the landscape in Lake Tahoe, the primary reason for this relates to the amount of impervious surface contained in the urban environment. precipitation falls onto streets, parking lots and buildings and, rather than infiltrating into the ground and being filtered by natural soils and vegetation, it runs off these surfaces, picking up pollutants in the process and routing them ultimately to the Lake.

Furthermore, TMDL stormwater monitoring data indicate a much higher proportion of fine sediment particles in urban runoff as compared to that from non-urban land uses.

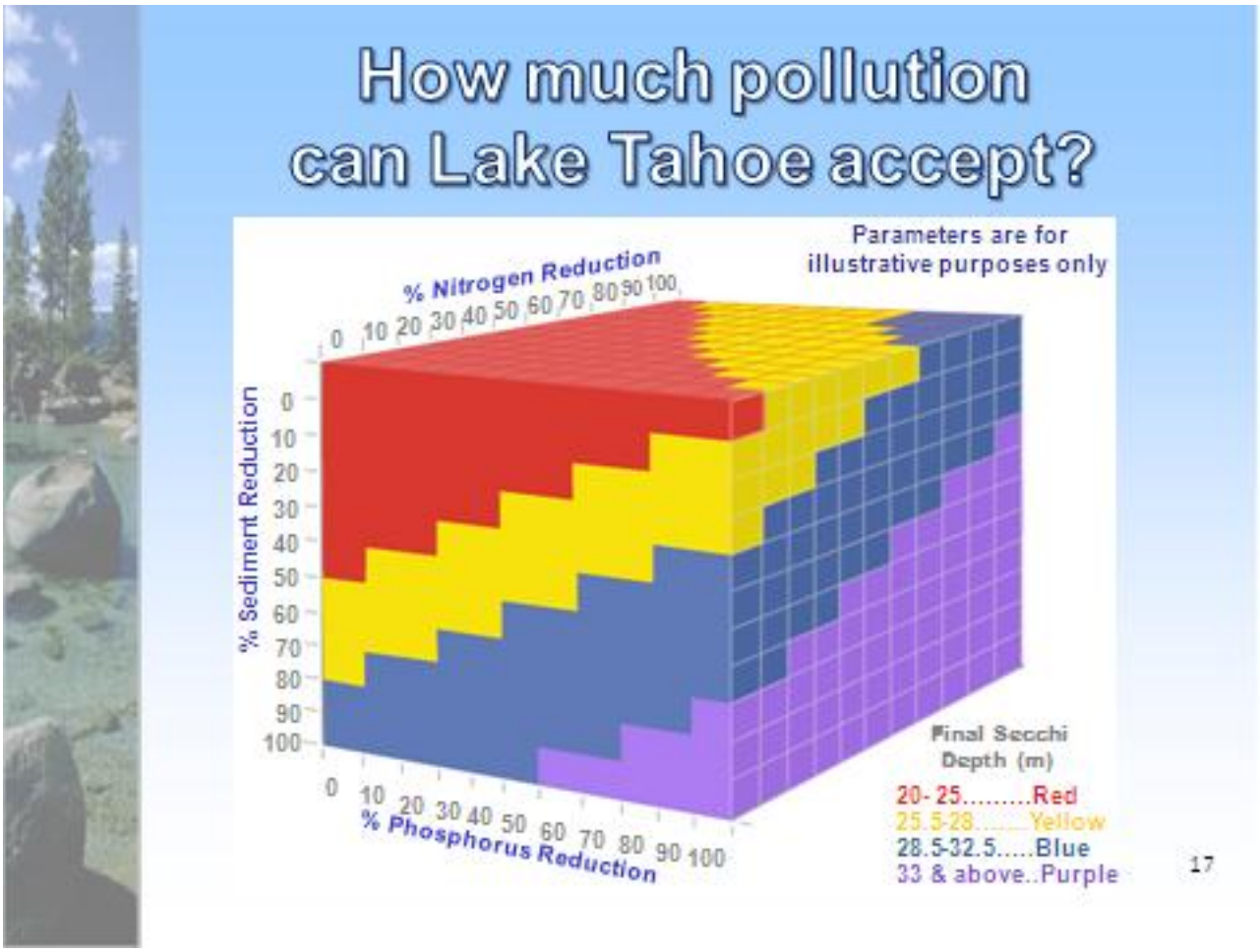


Roadways in particular are really bad actors:

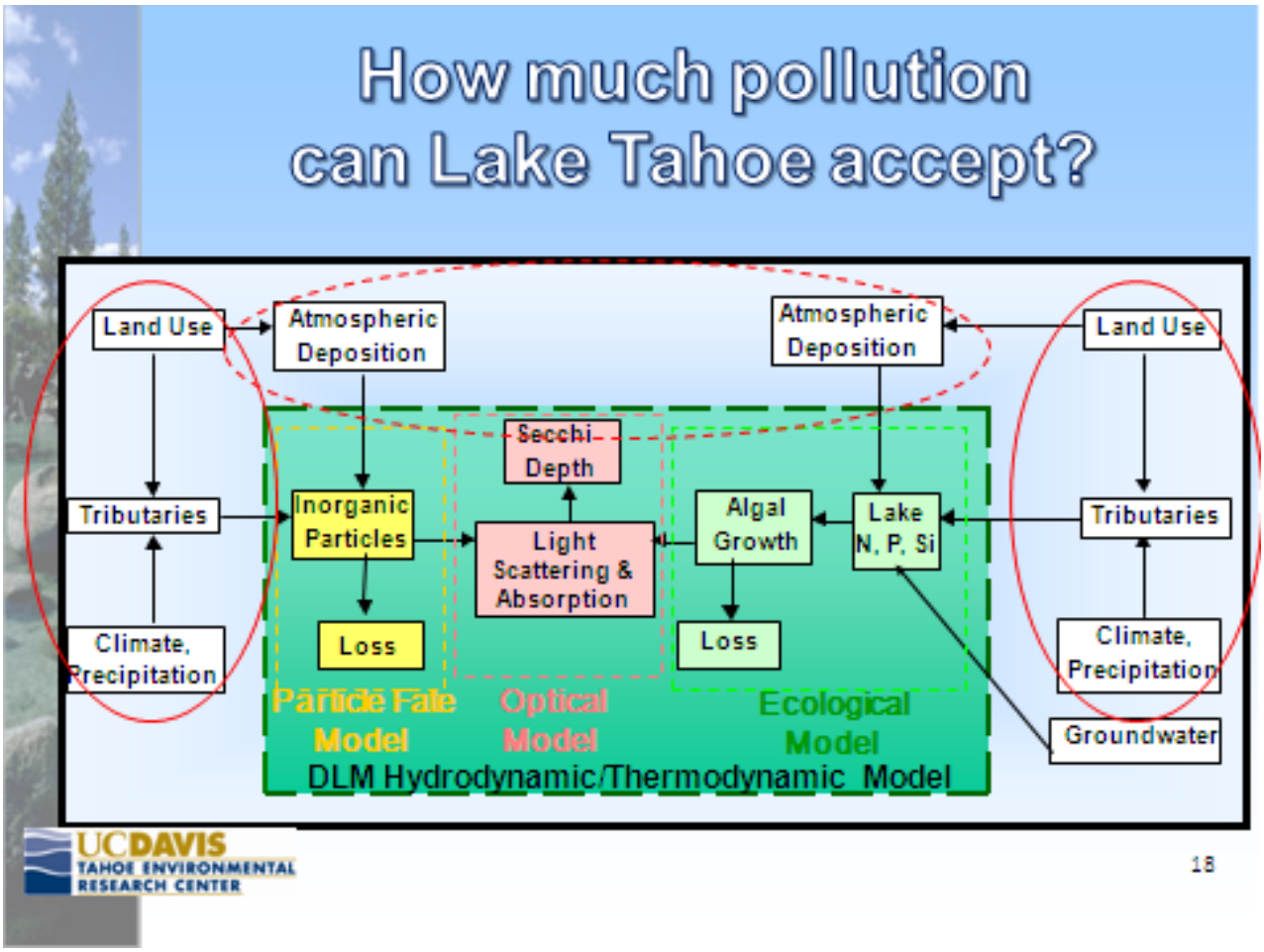
~ act as surfaces for pollutants to accumulate

~ facilitate FSP production through pulverization of roadway abrasives and roadway deterioration

~ as mentioned previously, prevent infiltration and effectively route runoff to local waters



The final question of Phase 1: HOW MUCH POLLUTION CAN LAKE TAHOE ACCEPT? is a very difficult question to answer, particularly because clarity is controlled by three pollutants. Thus, there are countless combinations of load reductions that are each capable of reaching the numeric target (illustrated by the conceptual clarity cube). Therefore, a tool capable of simulating lake response to various nutrient and FSP loading/input combinations would be very useful…



The Lake Tahoe Clarity Model is a customized application of the DLM Reservoir Model that has applied to many lakes and reservoirs throughout the world. It is a process-based numerical modeling system that integrates four models into one:

1. HYDRODYNAMIC/THERMODYNAMIC MODEL

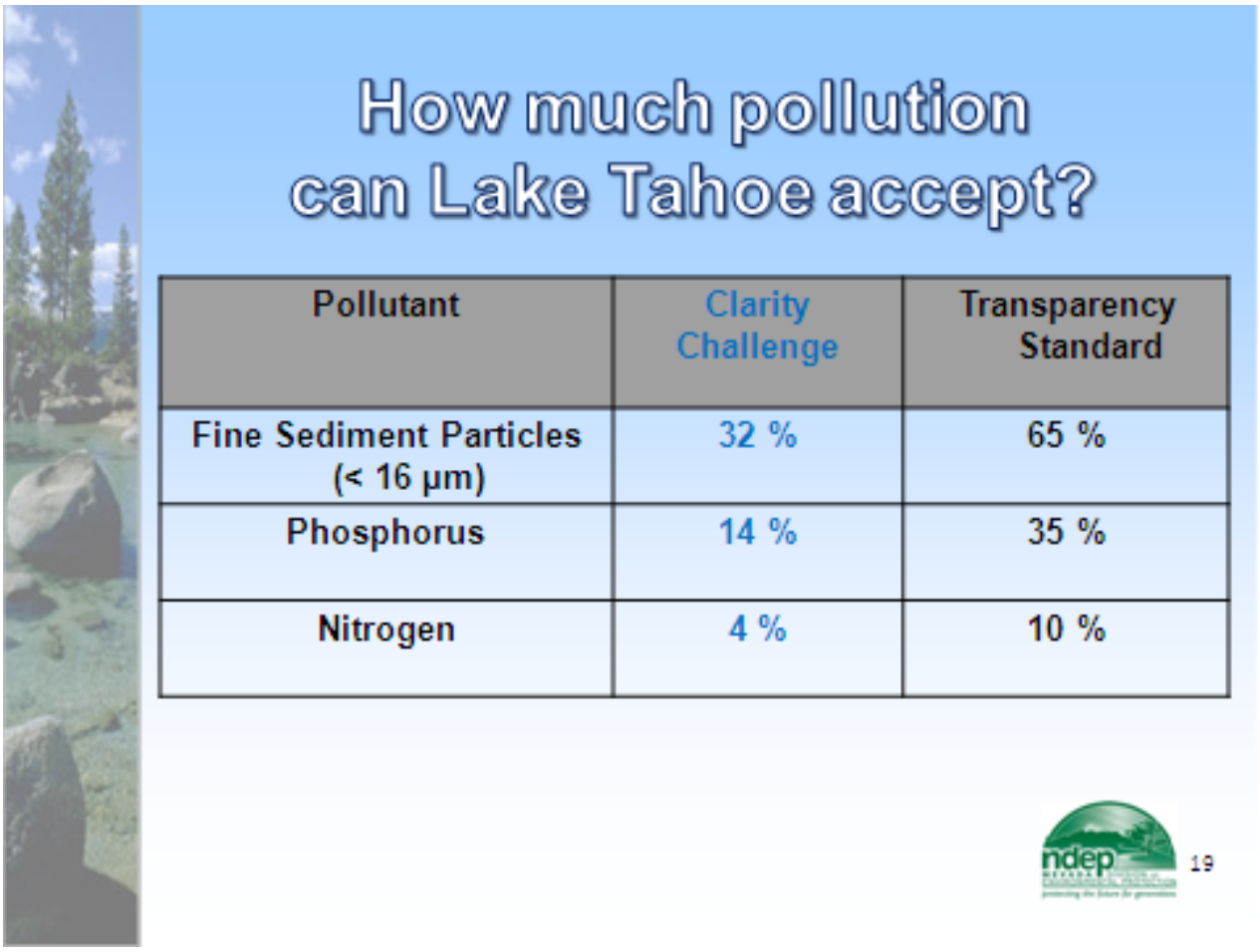
2. WATER QUALITY/ECOLOGICAL MODEL

3. PARTICLE FATE MODEL

4. OPTICAL MODEL

Based on inputs of climate, precip and pollutant loadings from the sources, an interrelated set of equations contained in the sub-models outputs a predicted annual average secchi disk depth.

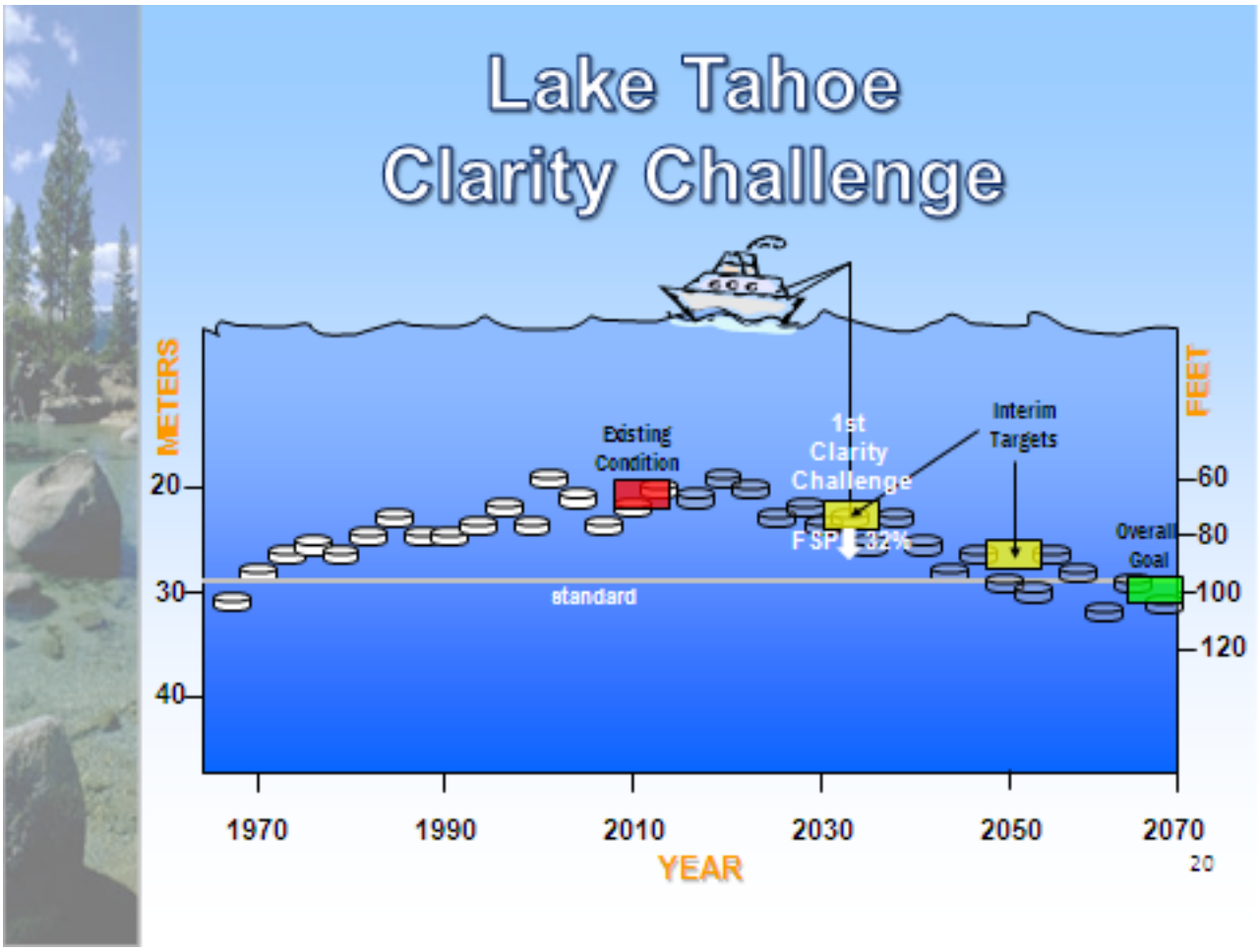
The Lake Tahoe Clarity Model has been adapted to Lake Tahoe and has been peer reviewed.



Results of the Loading Capacity analysis suggest:

1. Restoring clarity is possible but significant reductions will be needed in order to achieve clarity objectives (Transparency standards results)

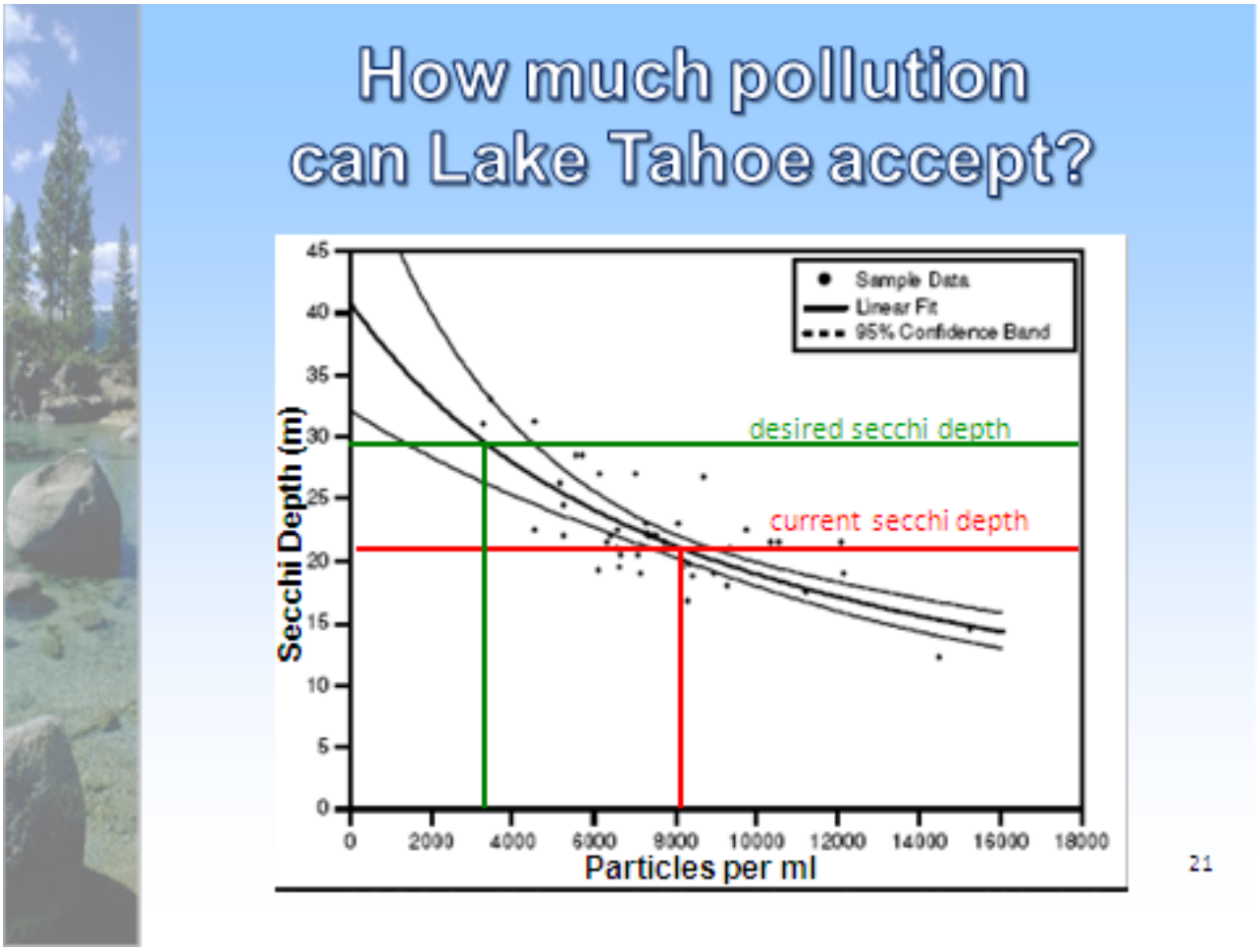
2. Clarity is more responsive to FSP reductions than nutrient reductions



The Clarity Challenge is an interim transparency goal that calls for basin-wide FSP and nutrient load reductions to achieve ~ 24 meters (~80ft) annual avg Secchi depth within 20 years.

The Clarity Challenge represents a reasonable yet ambitious goal that will mark a clear turning point from the decline in transparency. Scientists agree that once the Clarity Challenge is achieved we can confidently say we have actually started to restore clarity within Lake Tahoe.

Therefore, while the overall goal is to achieve the transparency standard, we really are concerned with meeting the Clarity Challenge over the next 15-20 yr timeframe.

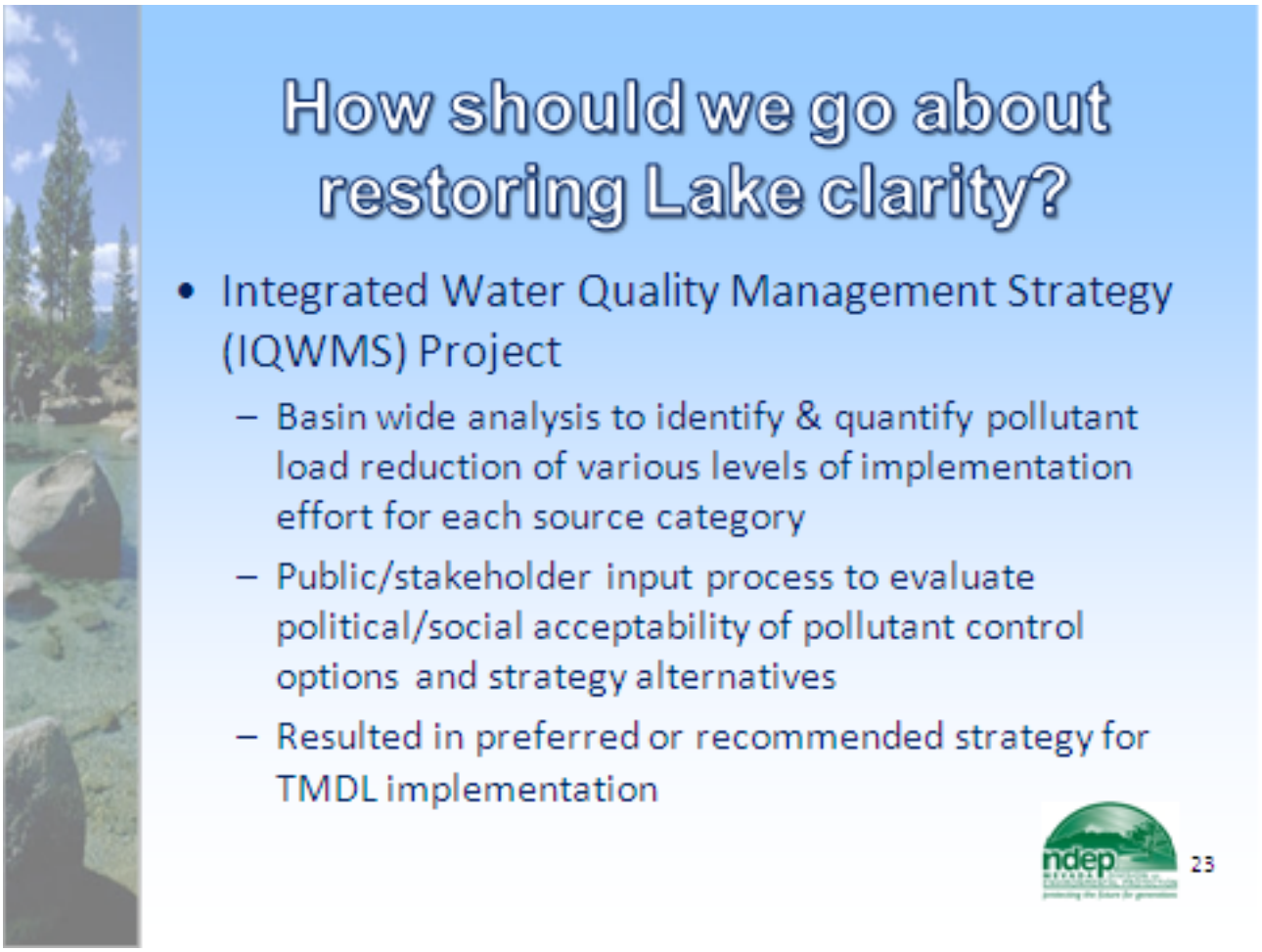


If you have a hard time believing the results of the model, here is a parallel line of evidence.

Graph shows in lake monitoring results of the relationship between number of in-lake particles (not loads) and Secchi depth.

[1-(3250/8000 particles per ml)] = 60%

This phase involved taking a look at the what load reduction opportunities existed and establishing load reductions that in sum are capable of achieving the Clarity Challenge.



The various levels of implementation effort were analyzed through a complementary Pollutant Opportunity Reduction (PRO) Analysis, for which a separate report was produced.

The PRO anlalysis involved a three step process for each of the source categories:

1. Pollutant control option screening and selection
2. Site scale analysis of various treatment tiers
3. Extrapolation to produce basin-wide estimates of pollutant reduction and costs

The results for the PRO analysis were then fed into the IWQMS process aimed at crafting a recommended strategy. The IWQMS involved a public/ stakeholder input process carried out between the fall of 2007 through the spring of 2008. The process involved Focus Groups who provided a more technical evaluation & PATHWAY forum (Glen Smith GID representative) which provided feedback and input with respect to political social acceptability of pollutant options and strategy alternatives. An iterative process of crafting alternatives, receiving input, condensing and refining the alternatives until a recommended strategy capable of achieving the Clarity Challenge and which received broad stakeholder support was produced.

Key outcomes of the IWQMS process:

1. Achieving the Clarity Challenge is feasible but options are limited
2. Focuses on FSP reductions (nutrient reductions are important for achieving the overall transparency standard)
3. Reductions in all source categories necessary but focused on urban stormwater (it is the largest source of FSP + P and is the greatest opportunity for load reductions.

Key Outcomes of the IWQMS process (CONT'D):

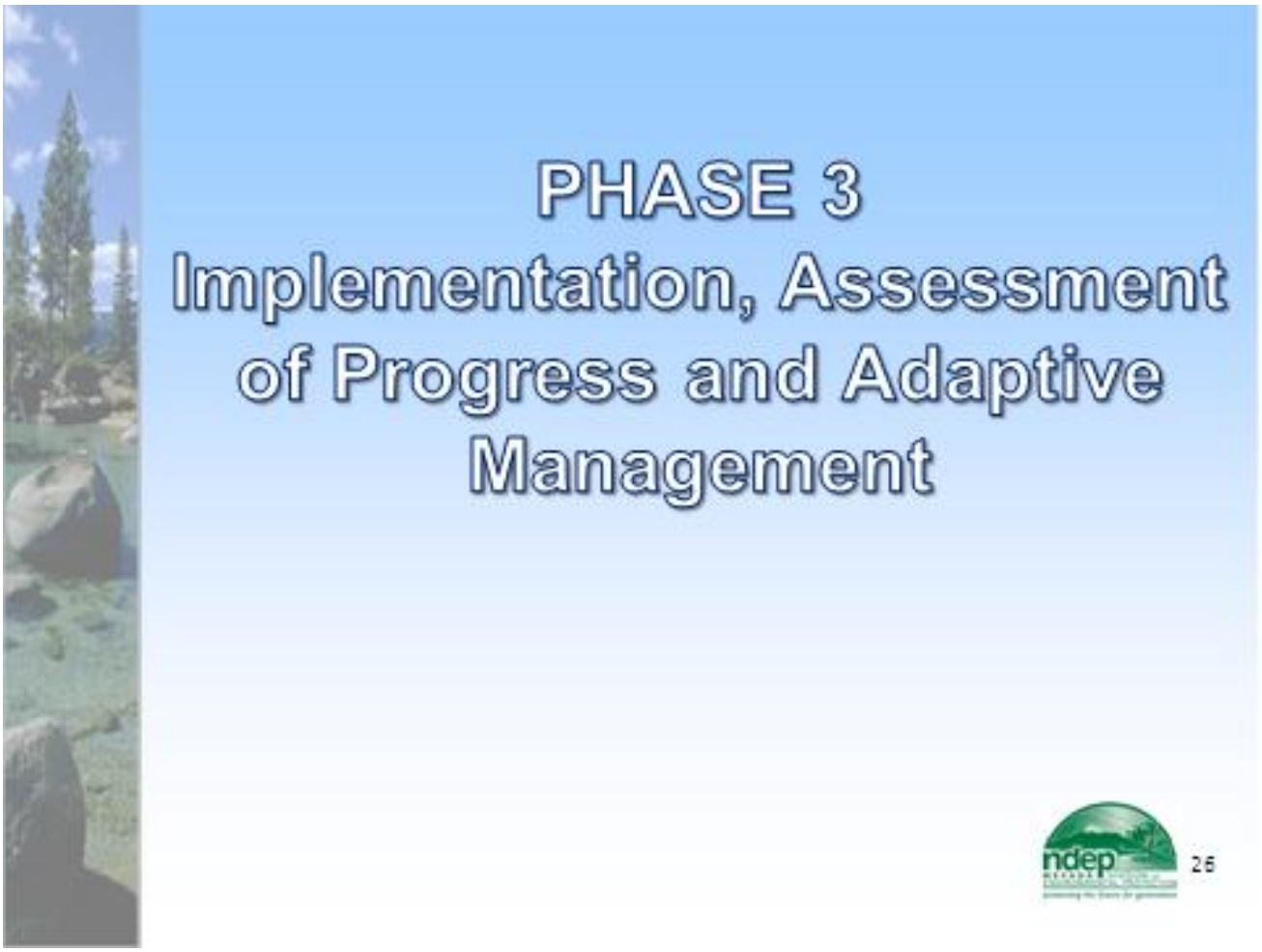
4. The IWQMS project clearly demonstrated that continuing to implement current practices with respect to urban stormwater will not enable us to meet the Clarity Challenge. Examples of advanced and innovative controls that will be necessary to be implemented include:

(a) alternatives to roadway abrasives application;

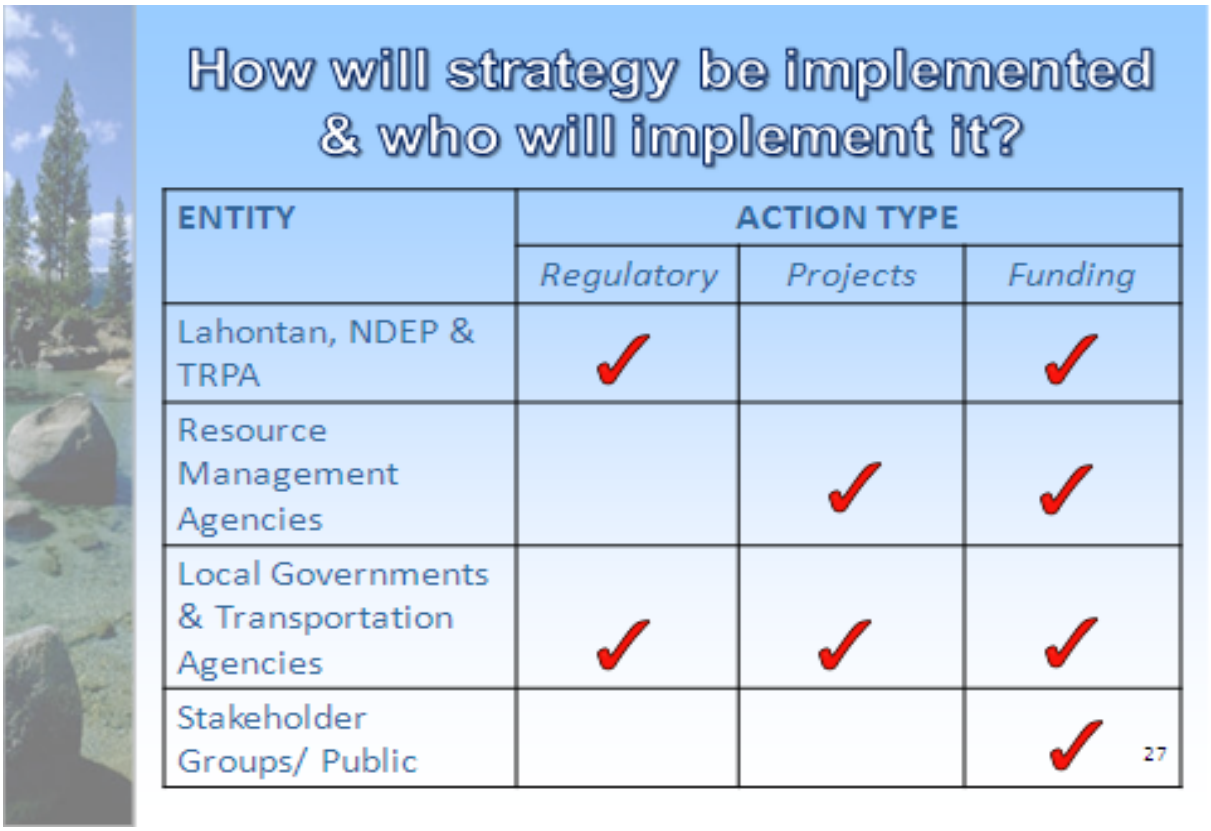
(b) enhanced roadway operations practices – ex: removing particles from roadways using vacuum sweepers;

(c) conveying stormwater to local or regional facilities that feature enhanced treatment through chemical or biological processes

5. $1.5 billion estimated cost = conservative, basin-wide estimate with many caveats and assumptions. We hope to refine this number in the future, especially the costs related to the urban stormwater source category. While this cost is indeed large, it is consistent with expenditures over the previous decade on WQIPs implemented through the Tahoe Regional Planning Agency's Environmental Improvement Program (~$500M over 10 yrs).



Phase 3, the current phase, represents the transition from the science-based policy formation phases to the implementation and performance evaluation phase.



We expect the recommended strategy to be implemented by local government agencies, as well as state, regional and federal regulatory and land management agencies through their respective programs.

Lahontan & NDEP = stormwater permits + project funding through 319 and helping develop/secure regional revenue sources

TRPA will develop programs, codes & regulations, and incorporate projects in the EIP to address nonpoint sources and potentially point sources as well. They will also be a major player in developing and securing funding to implement these programs and projects.

USFS & State natural resource agencies = forest & watershed restoration/implementation projects. They are also part of the funding puzzle as most of the federal share of monies to accomplish EIP I has been funneled through these agencies.

Local jurisdictions & transportation agencies expected to lead the efforts of planning for and implementing on-the-ground actions to meet TMDL load reductions for the urban stormwater source category. In the past local agencies have not been a main source of funding for pollutant control projects; we expect this to continue into the future.

Public/Stakeholder groups are also going to be key in terms of supporting the need for such projects and a key component for securing funding for their implementation. Also – Tahoe Fund, and private public partnerships through redevelopment opportunities.

We expect the recommended strategy to be implemented by local government agencies, as well as state, regional and federal regulatory and land management agencies through their respective programs.

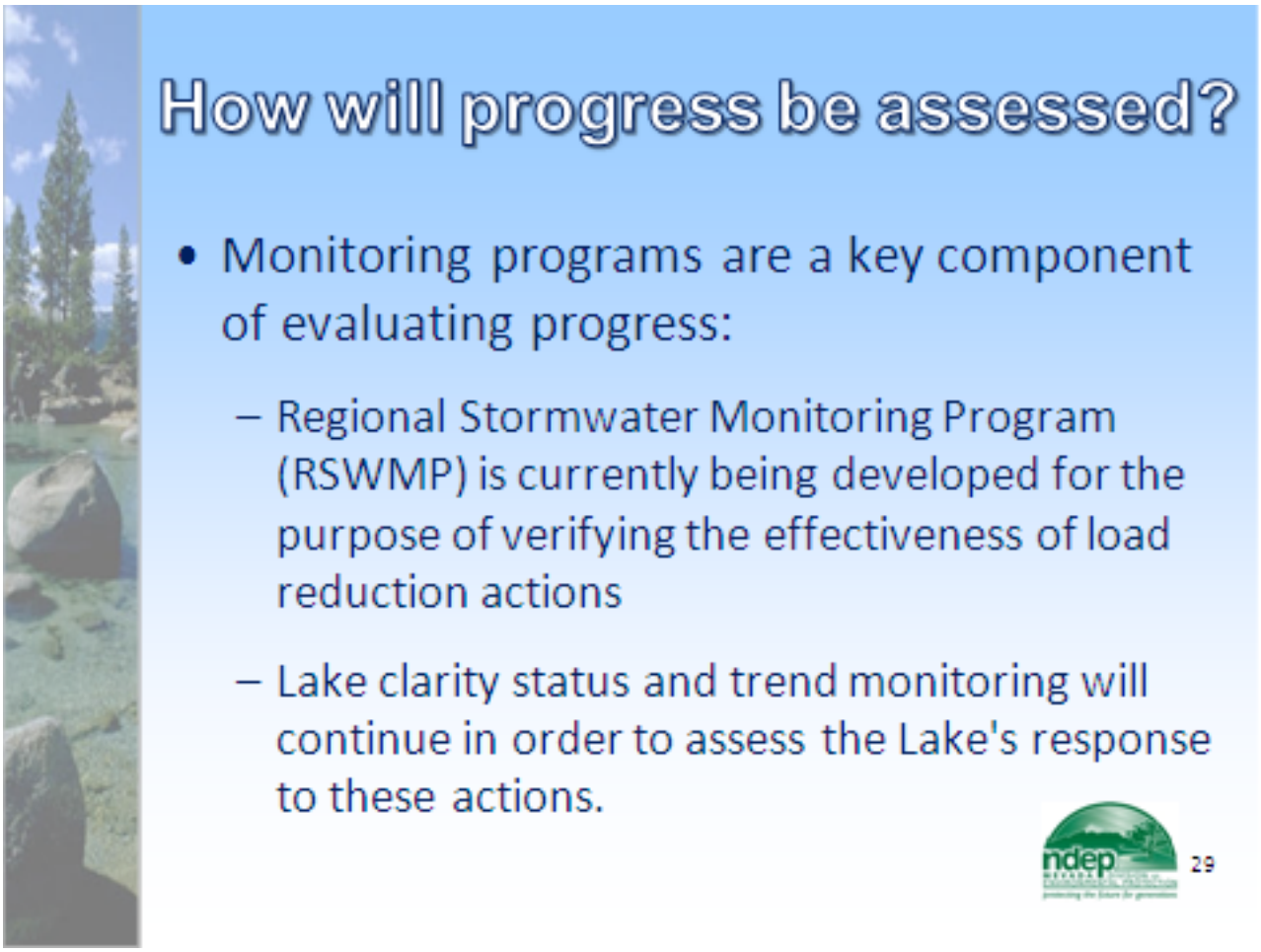
1. Lahontan & NDEP issue permits/agreement and help fund capital costs for improvements and help develop/secure regional revenue sources;

2. TRPA will develop programs, codes & regulations, and incorporate projects into the EIP. They will also be a major player in developing and securing funding to implement these programs and projects.

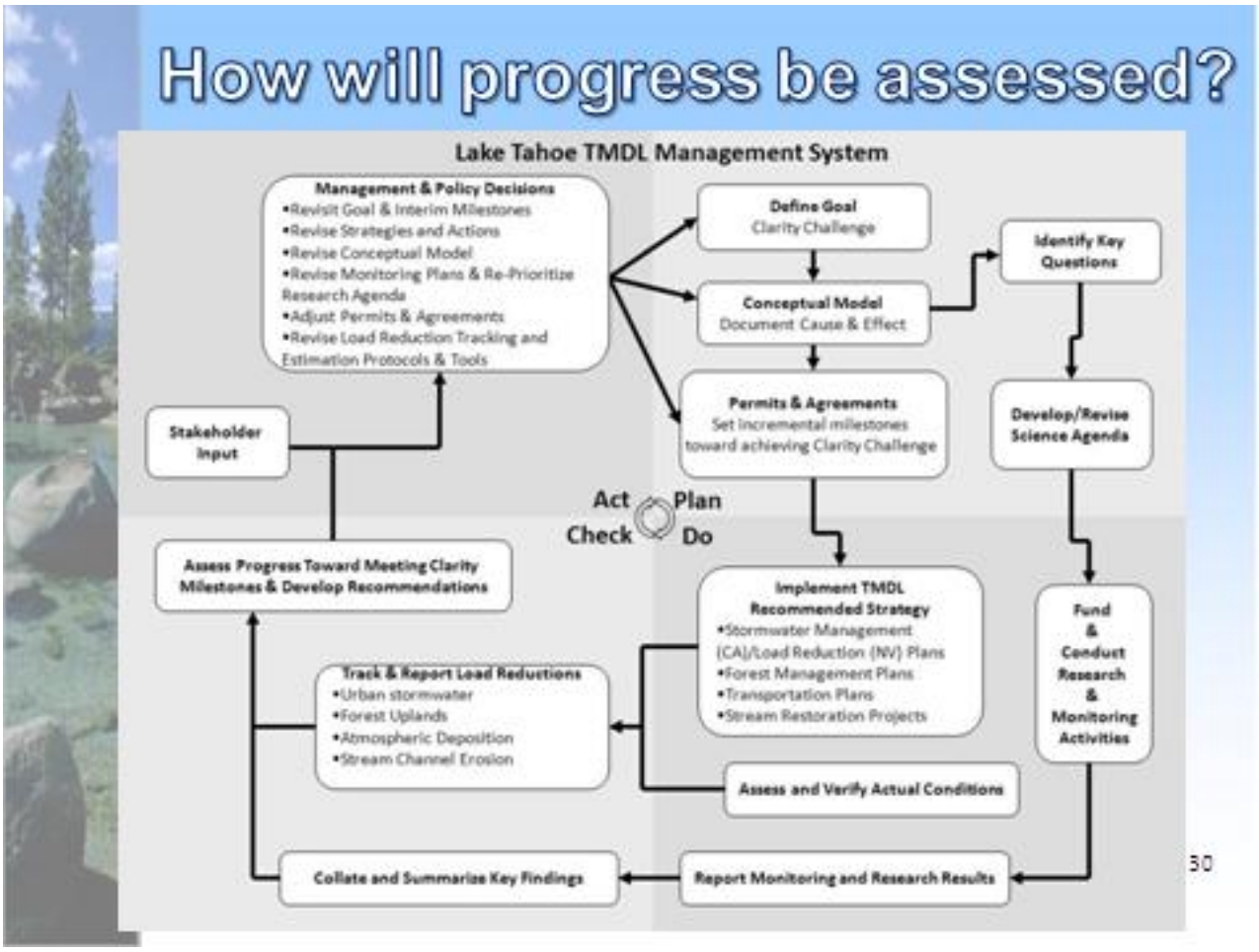
3. USFS & State natural resource agencies will implement forest & watershed restoration/implementation projects. They are also part of the funding puzzle as they maintain grant programs that pay for capital costs for urban water quality improvement projects.

4. Local jurisdictions & transportation agencies are expected to lead the efforts of planning for and implementing on-the-ground actions to meet TMDL load reductions for the urban stormwater source category.

5. Public/Stakeholder groups are also going to be key in terms of supporting the need for such projects and a key component for securing funding for their implementation. Also, a recent Tahoe Fund enables private citizens to donate funds that will contribute to EIP projects; finally, we anticipate private-public partnerships to be established through future redevelopment projects.



We are going to assess progress toward meeting TMDL load reduction milestones (target within specific timeframe) through a variety of mechanisms. First is monitoring…



Second is the Lake Tahoe TMDL Management System. In a nutshell, the Management System will establish the process by which TMDL implementation will be managed into the future. It will be based on the Plan-Do-Check-Act continuous improvement/adaptive management cycle that many private businesses use and for which a generalized management system manual for Lake Tahoe resource programs was completed.

Specifically, the TMDL Management System will establish the guidance and operational protocols for:

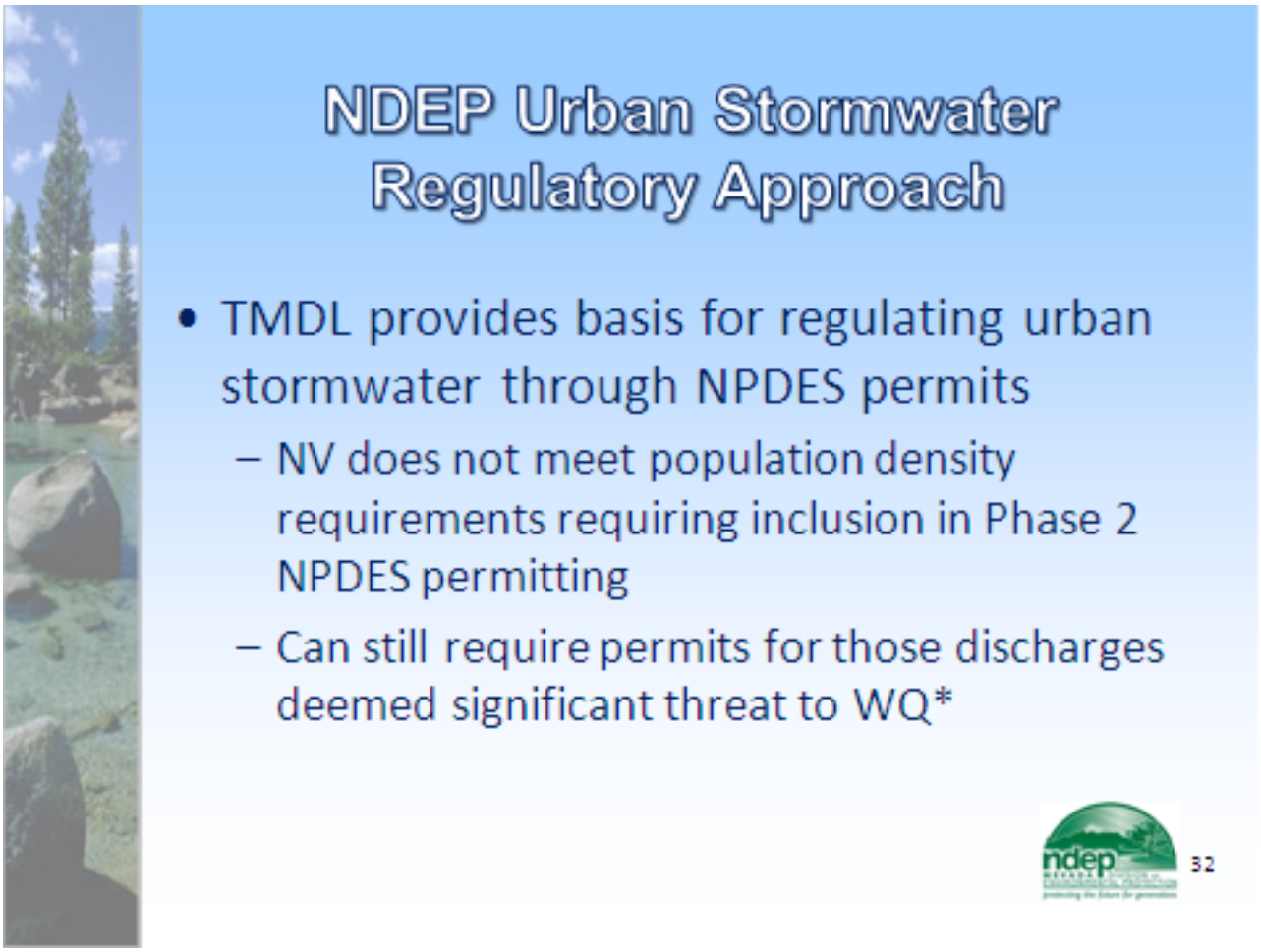
1.Tracking implementation activities and assembling this information together with monitoring data to evaluate progress toward meeting the Clarity Challenge

2. Identifying information gaps and key questions

3. Incorporating new information and making programmatic and related policy adjustments

4. Establishing formal roles, relationships and communication structure between entities

TMDL IMPLEMENTATION
Urban Stormwater Source Category



Typically, TMDLs are implemented by regulating urban stormwater discharges through National Pollutant Discharge Elimination System (NPDES) permits. Although Lake Tahoe does not meet the population-density requirements to trigger automatic inclusion into the NPDES program, the Lake Tahoe TMDL provides the scientific evidence suggesting urban stormwater discharge is a significant threat to water quality.

The question is: should NDEP issue permits to implement the TMDL or can a more flexible approach to implementation be equally or more effective?

Collaborative:

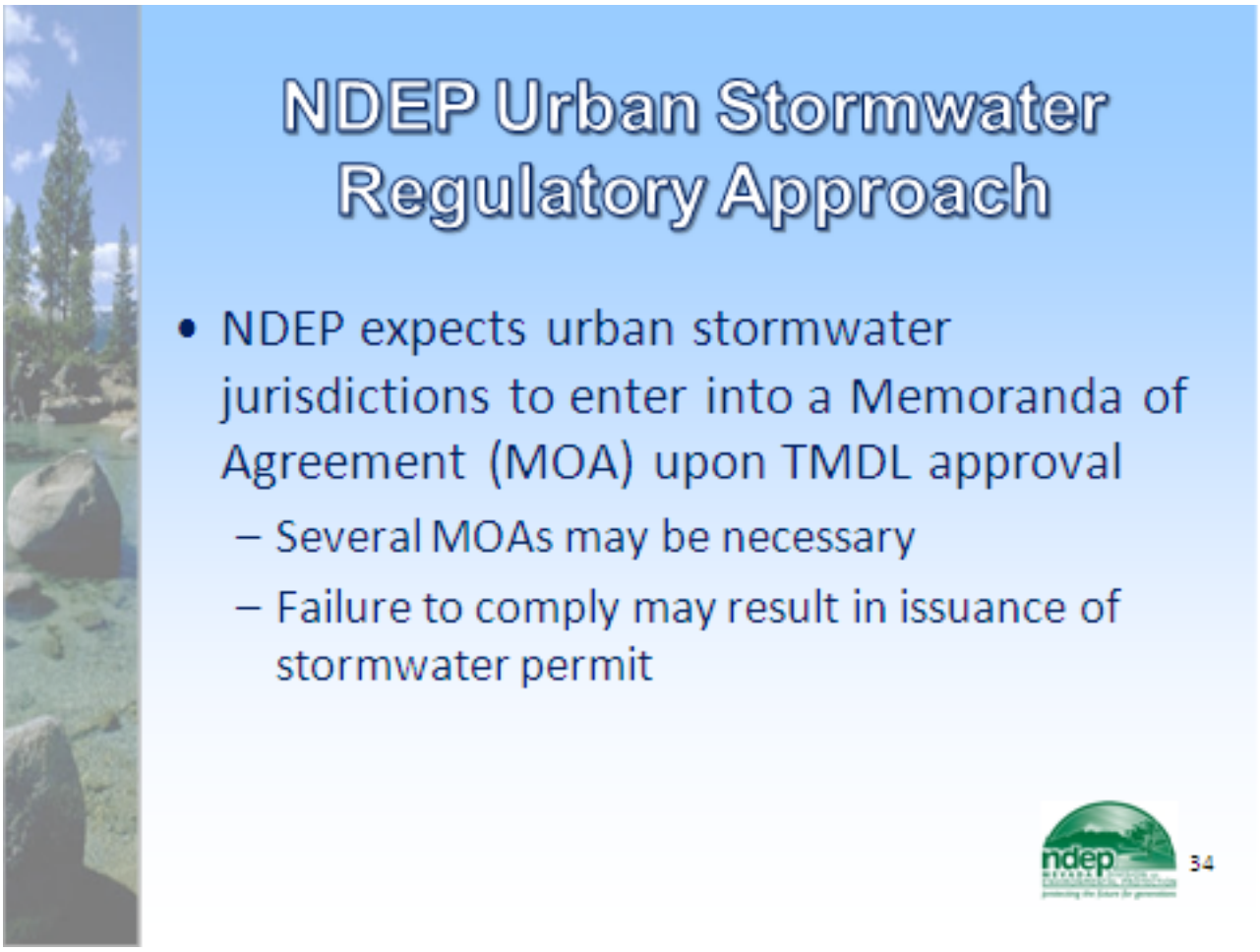
- Addressing the problem is seen as collaboration between regulators and regulated communities; a "team effort" as opposed to jurisdictions going at it alone.

Funding flexibility:

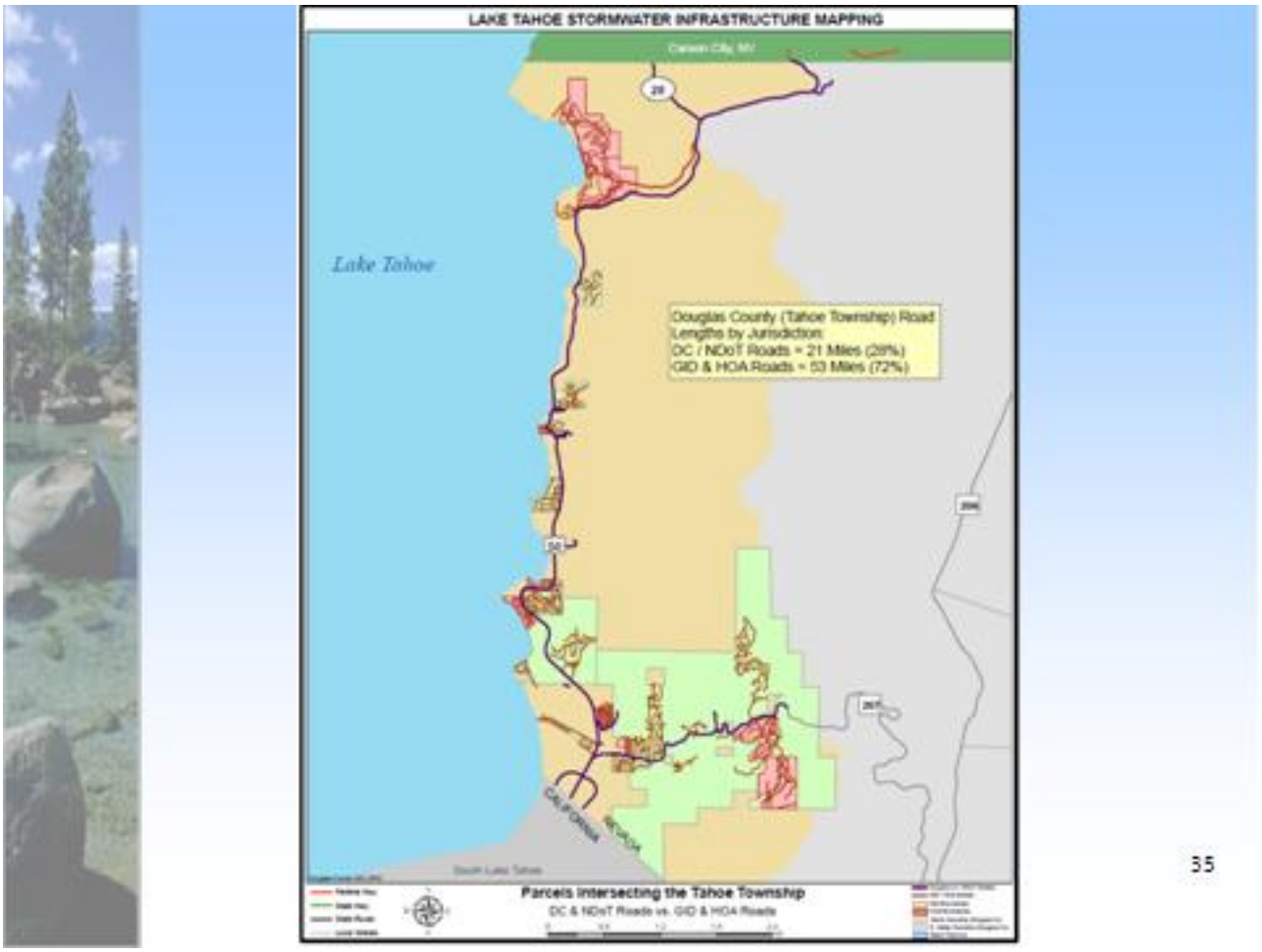
- NDEP is very sensitive to the expectation that implementation agencies shall foot the bill for the ginormous cost estimated to achieve the Clarity Challenge; it does not make any sense to limit implementers from pursuing and using any potential opportunities to fund actions to improve lake clarity. The agreement approach does not exclude implementers from pursuing grant opportunities for which they might not be eligible if a permit were in place (319 funding cannot be used to fund activities required by a permit)

Program Efficiency:

- Minimizing operational costs is particularly important in this day and age of budget reductions. There are some inefficiencies with the "one size fits all" NPDES stormwater program; the MOA will facilitate a customized program for Nevada Lake Tahoe that is capable of addressing the distinct problem of clarity loss in a more efficient and effective manner. Overall, the agreement approach is a workable approach that may actually lead to actions being implemented on the ground more quickly because of the streamlined process.

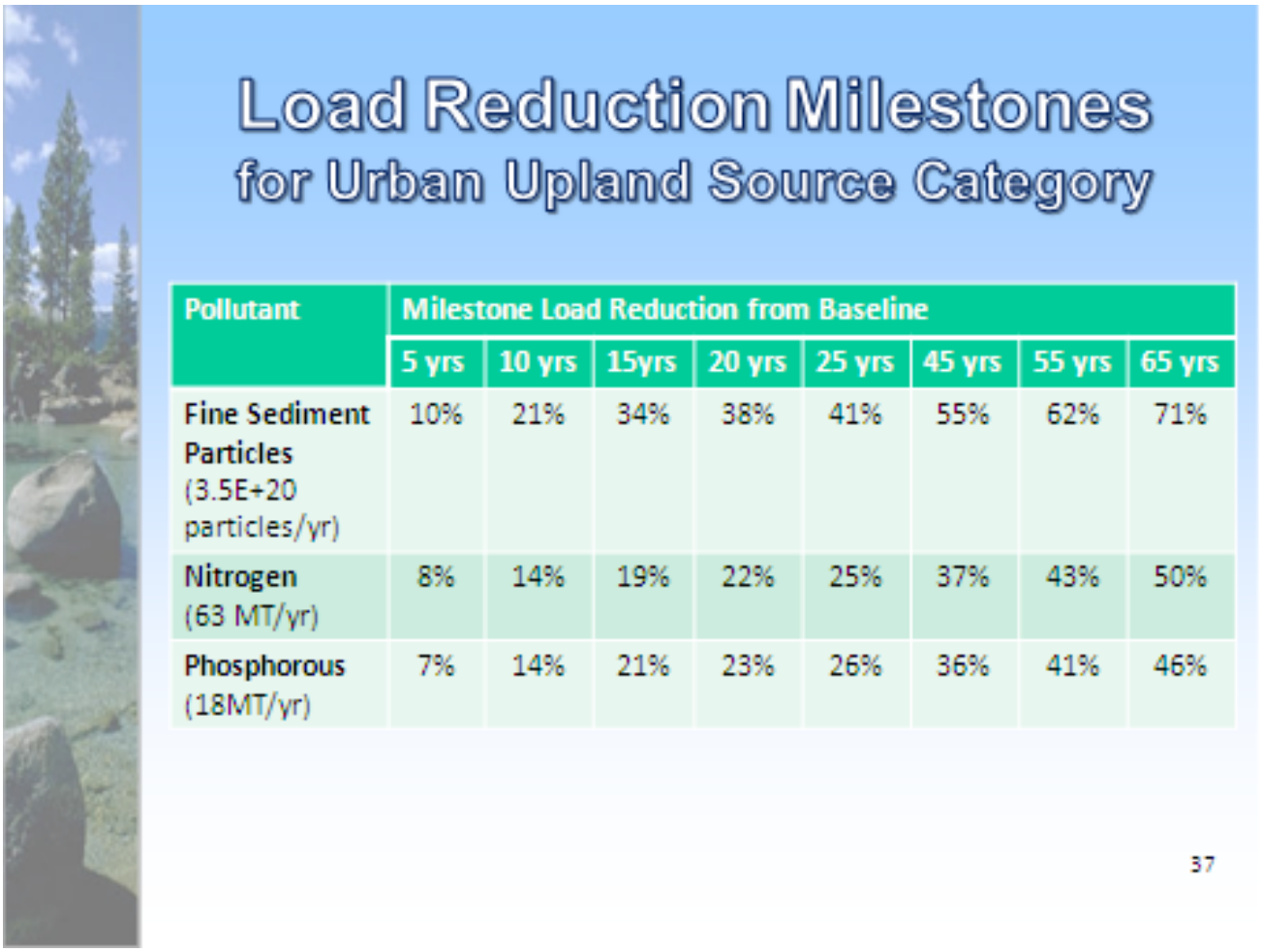


However, not everyone shares as much enthusiasm for this approach. In particular, EPA has expressed concerns with this approach (see their comments submitted to NDEP online in *NDEP Responses to Responses Received on the Draft Lake Tahoe TMDL* documented posted online. However, they have given us verbal confirmation that they will let us at least try this approach first before issuance of a permit. We have two years from EPA approval of the Final TMDL Report to get the MOAs in place. Failure to sign on to the MOA will likely result in issuance of an NPDES stormwater permit.



This map shows that Douglas County actually owns and maintains very little of the roadways, the primary land use of concern, in the Tahoe Douglas region. Therefore, in Tahoe Douglas, the MOA is proposed to be entered by NDEP, Doulas County and the GIDs.

Those topics marked by asterisk will be discussed further in upcoming slides.

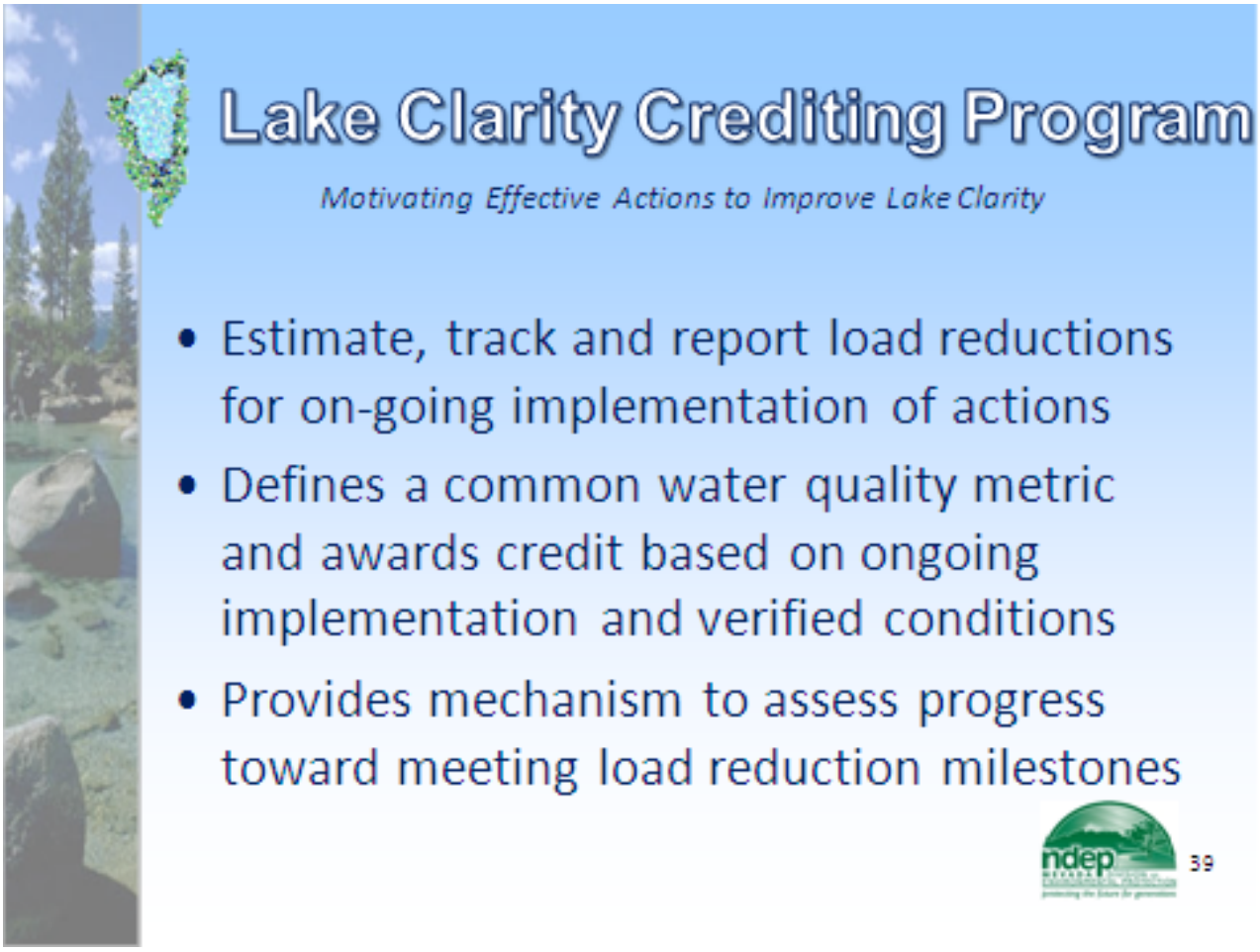


Milestones are target load reductions from baseline within a specified timeframe. Milestones for each source category are specified in the Final TMDL Report. This table is a modified version from the urban stormwater source category milestone schedule contained in that document. Milestone tables are essential for inclusion in the MOA because they provide a basis to assess jurisdictional progress toward meeting load reduction responsibilities.

SLRP development will result in these outcomes:

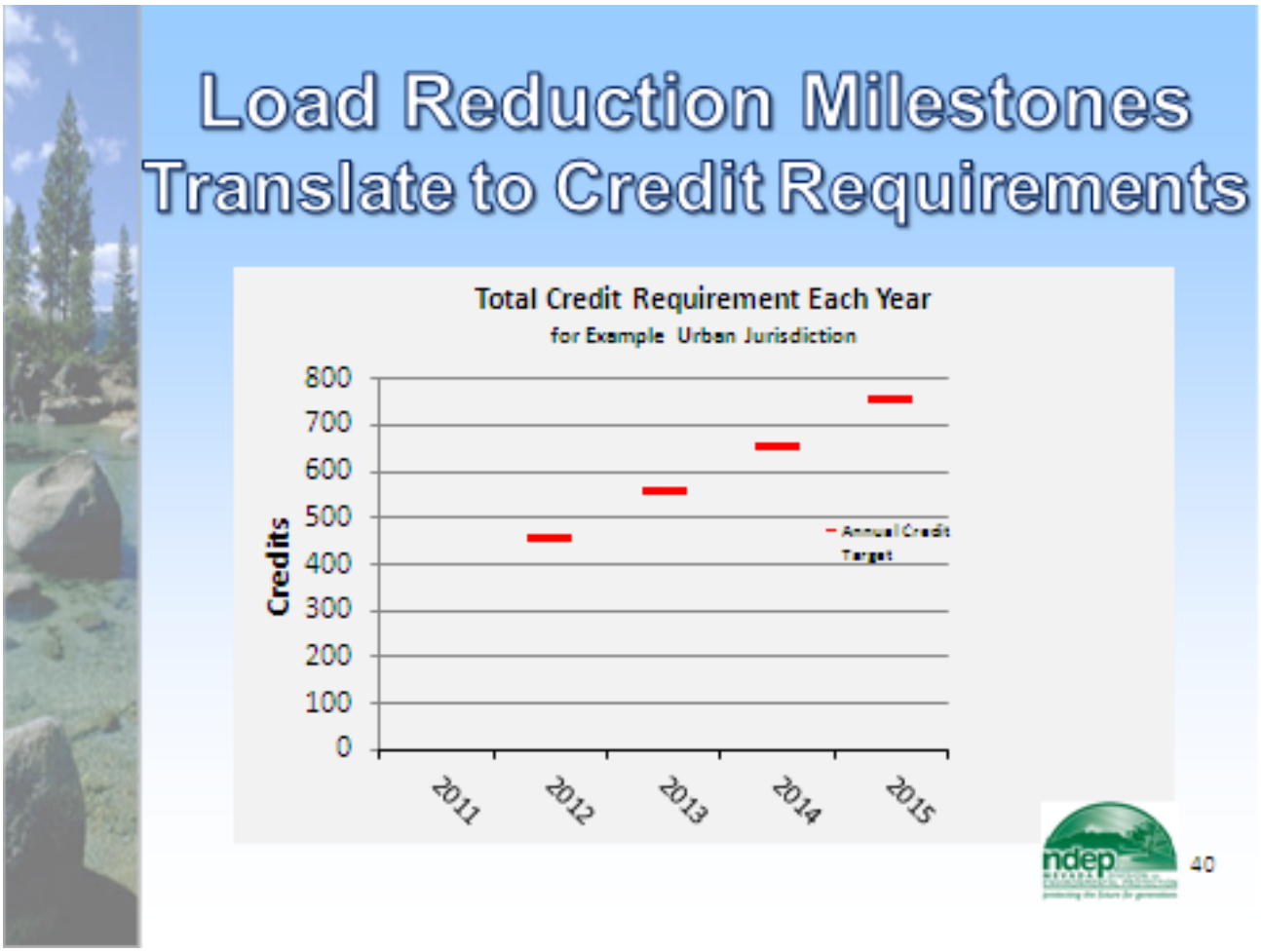
1. Catchment delineation
2. Define baseline loading for jurisdictions
3. Prioritized list of catchments for implementation according to load reduction potential
4. Description of the general actions and strategies (including operations and maintenance) that will allow jurisdiction to meet its load reduction obligation
5. This information will feed into Budget and Finance Plan, so more accurate assessment of costs can be produced

A Round 11 Capital Southern Nevada Public Lands Management Act (SNPLMA) grant has been secured to fund SLRP development for the Nevada Tahoe jurisdictions. The project will be a collaborative effort between NDEP and the NV Tahoe urban stormwater jurisdictions.



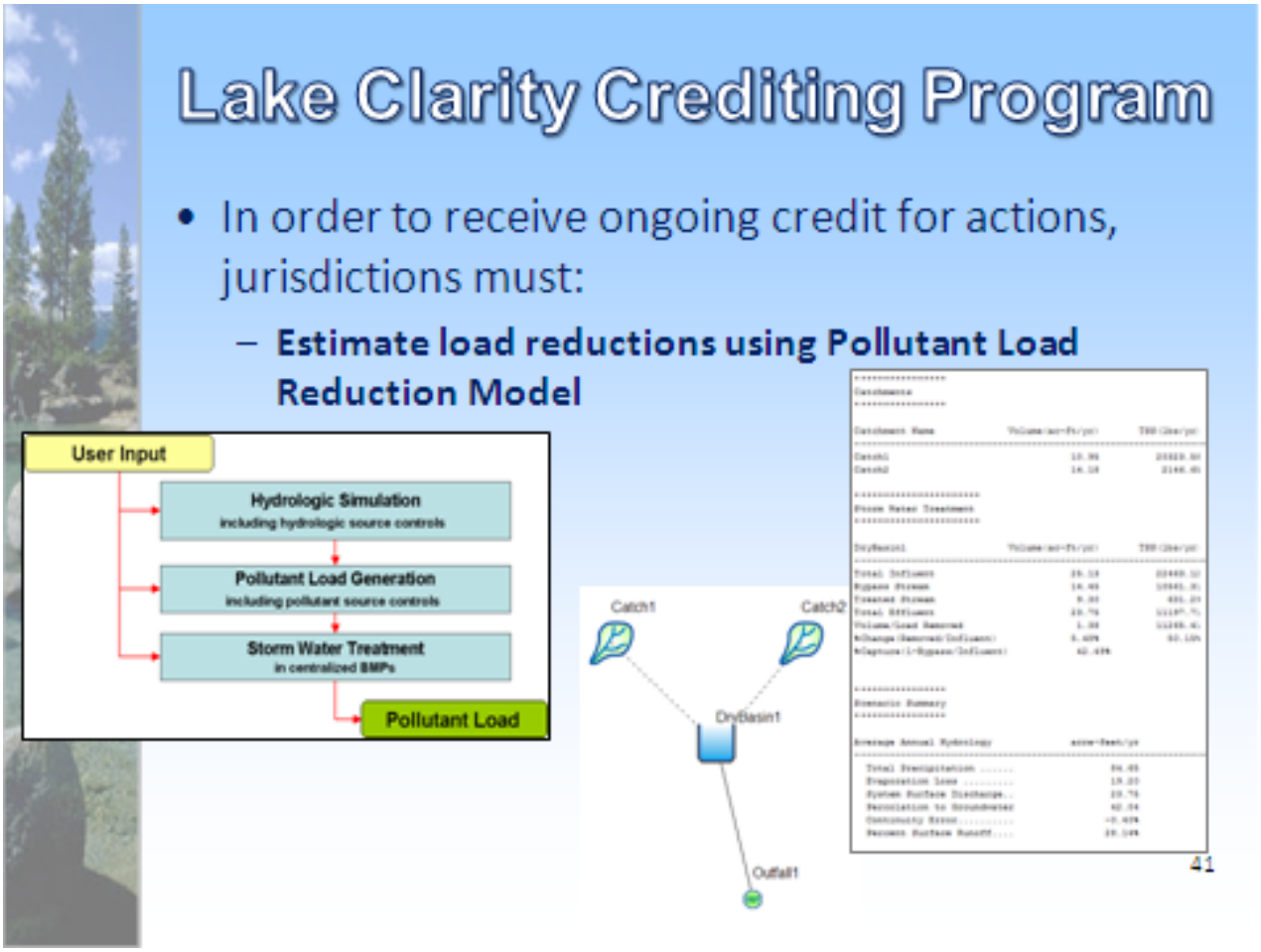
The Lake Clarity Crediting Program is the mechanism by which compliance with milestone schedules will be assessed. Moreover, it is the level playing field that ensures consistency in estimating and tracking load reduction actions between jurisdictions and between the disparate regulatory approaches that will be applied within Nevada and California.

Why is the Crediting Program necessary? ACCOUNTABILITY: in order to keep federal and state funds streaming to Tahoe, we must be able to show what the expenditures of money has bought the taxpayers. In the past, decision-makers have been disappointed by the tracking of accomplishments that has taken place.

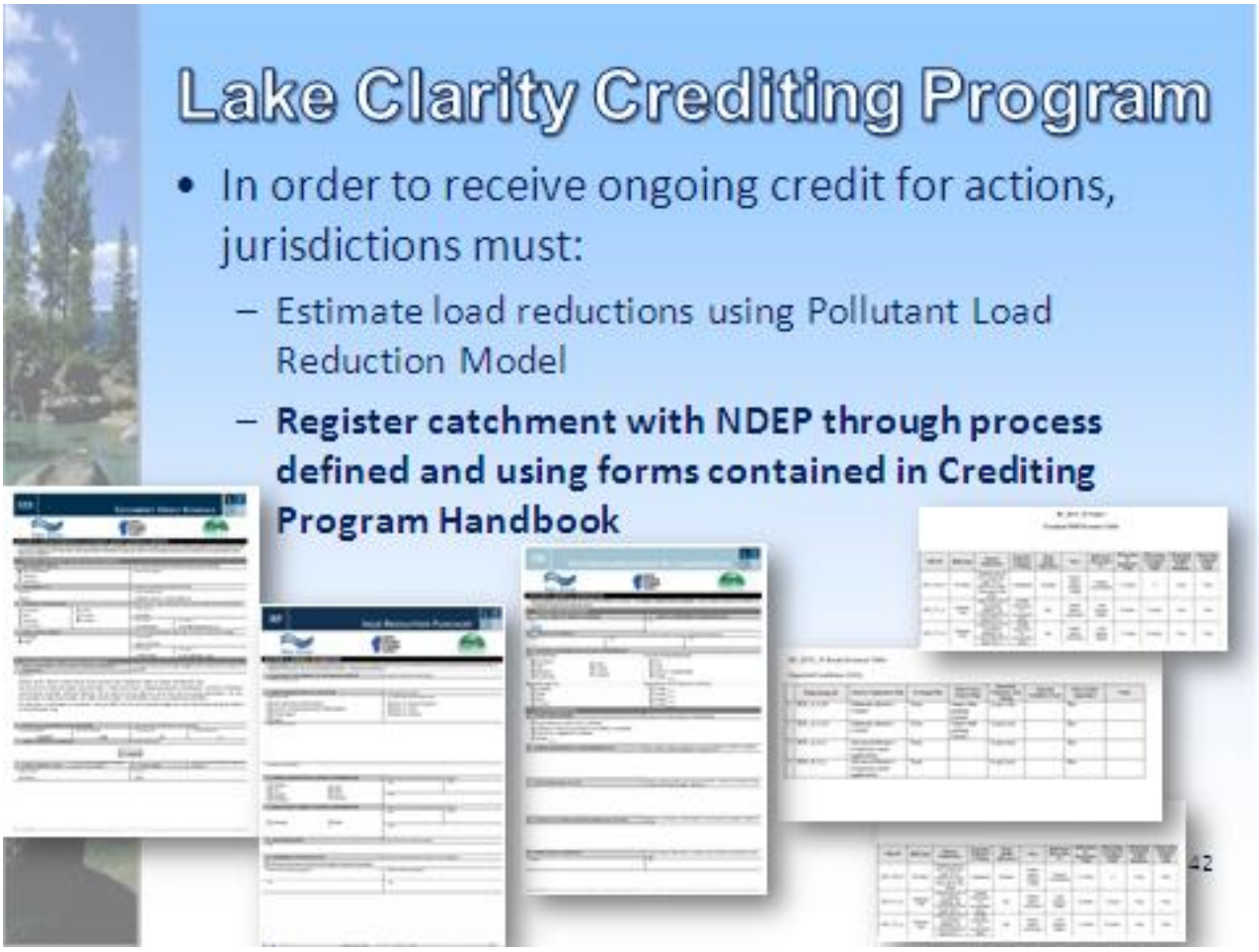


This figure shows Credit Requirement Schedules that shall be contained in MOA for respective jurisdictions. Notice that the credit requirement ramps up through time.

So how, does a jurisdiction get credit? In order to receive credit, jurisdiction must do several things…



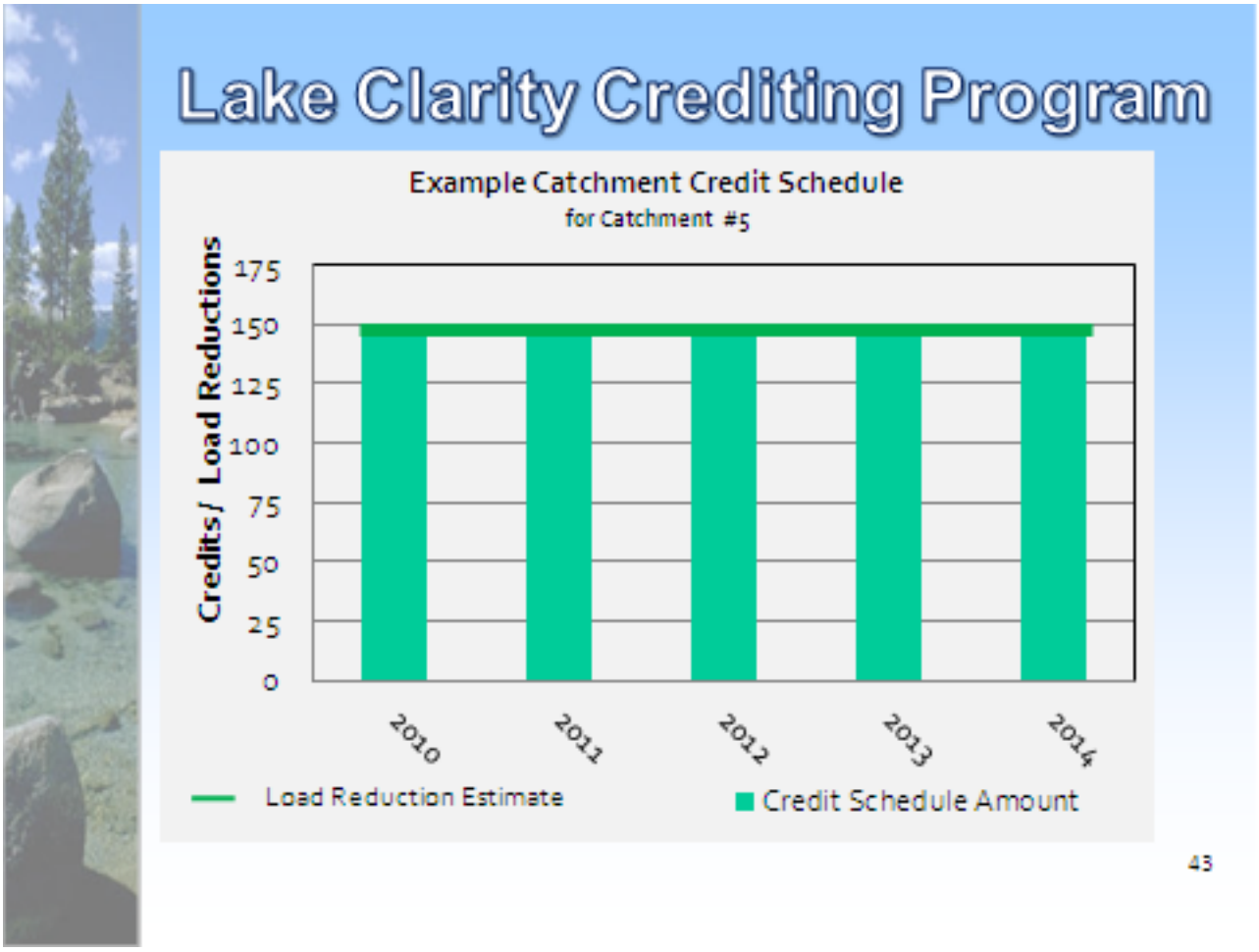
PLRM is a continuous hydrologic simulation model that simulates the pollutant load generation from urban land uses as well as the effects of pollutant source controls and stormwater treatments implemented in a specific project area (called a catchment); essentially it allows you to model the long-term annual average pollutant loading for a catchment. Comparing the baseline condition scenario (pre-implementation) to post implementation scenario yields an expected pollutant load reduction of fine sediment particles, nitrogen and phosphorous.



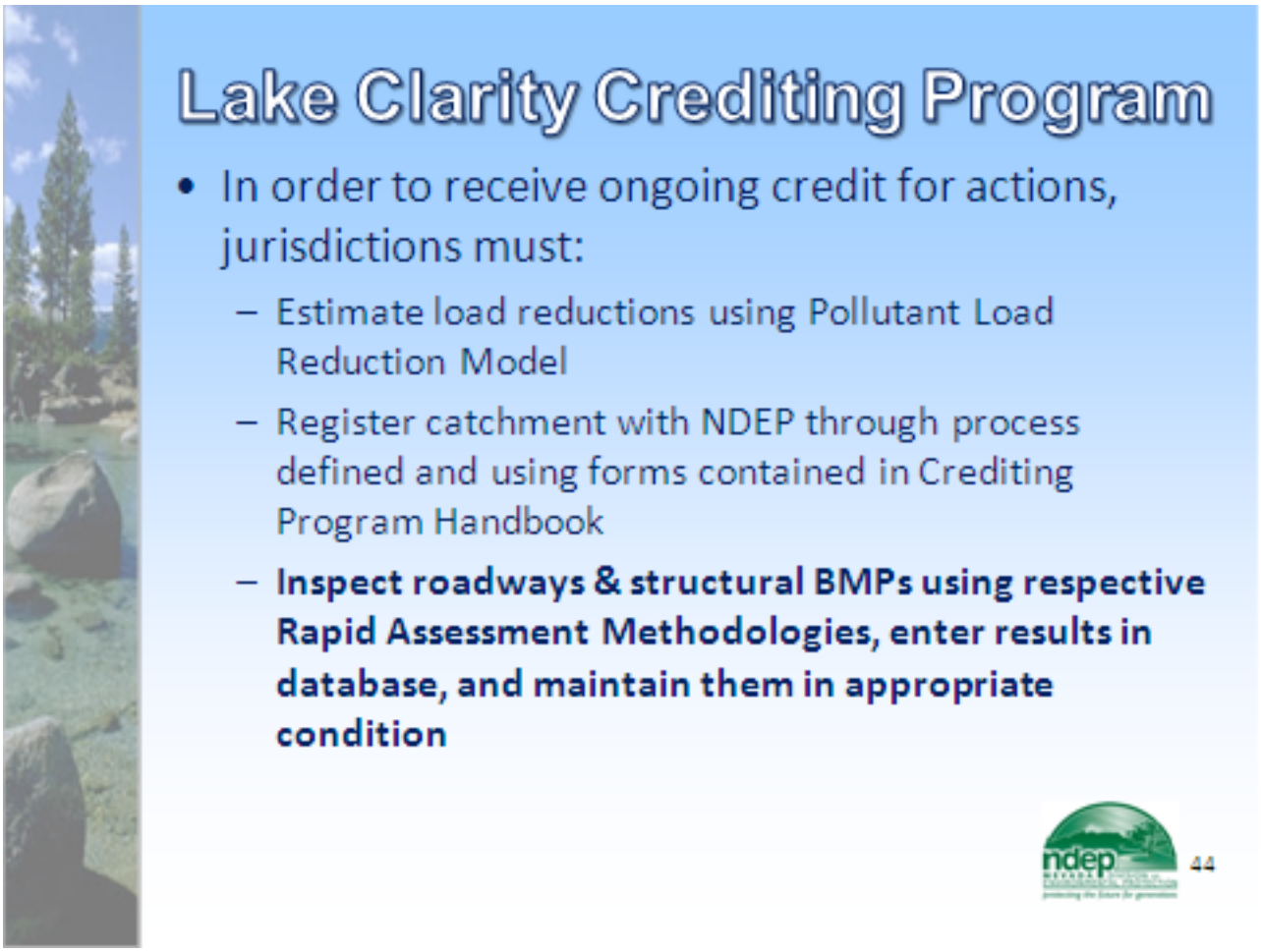
Registering a catchment involves filling out the Catchment Credit Schedule (CCS) forms contained in the Tools and Template tab of the Crediting Program Handbook (available online) and providing all necessary supporting documentation.

Section C of the CCS is the Catchment Implementation Plan Summary where jurisdictions summarize:

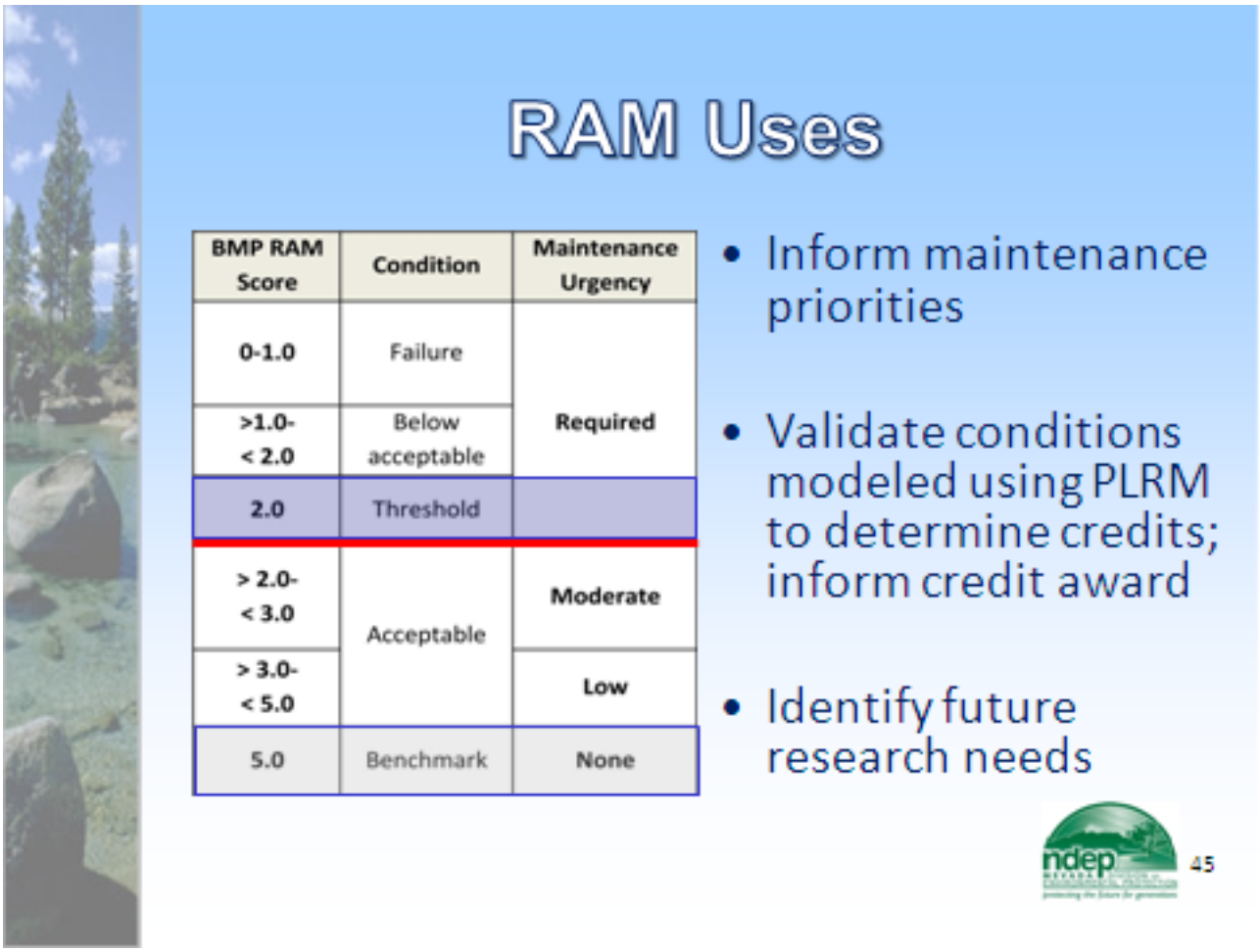
1. The load reduction strategy, including Treatment BMP Implementation, Roads operations and Private parcel BMP Implementation
2. The maintenance and inspection activities
3. The specific roles and responsibilities of the county and the applicable GID in which the catchment resides



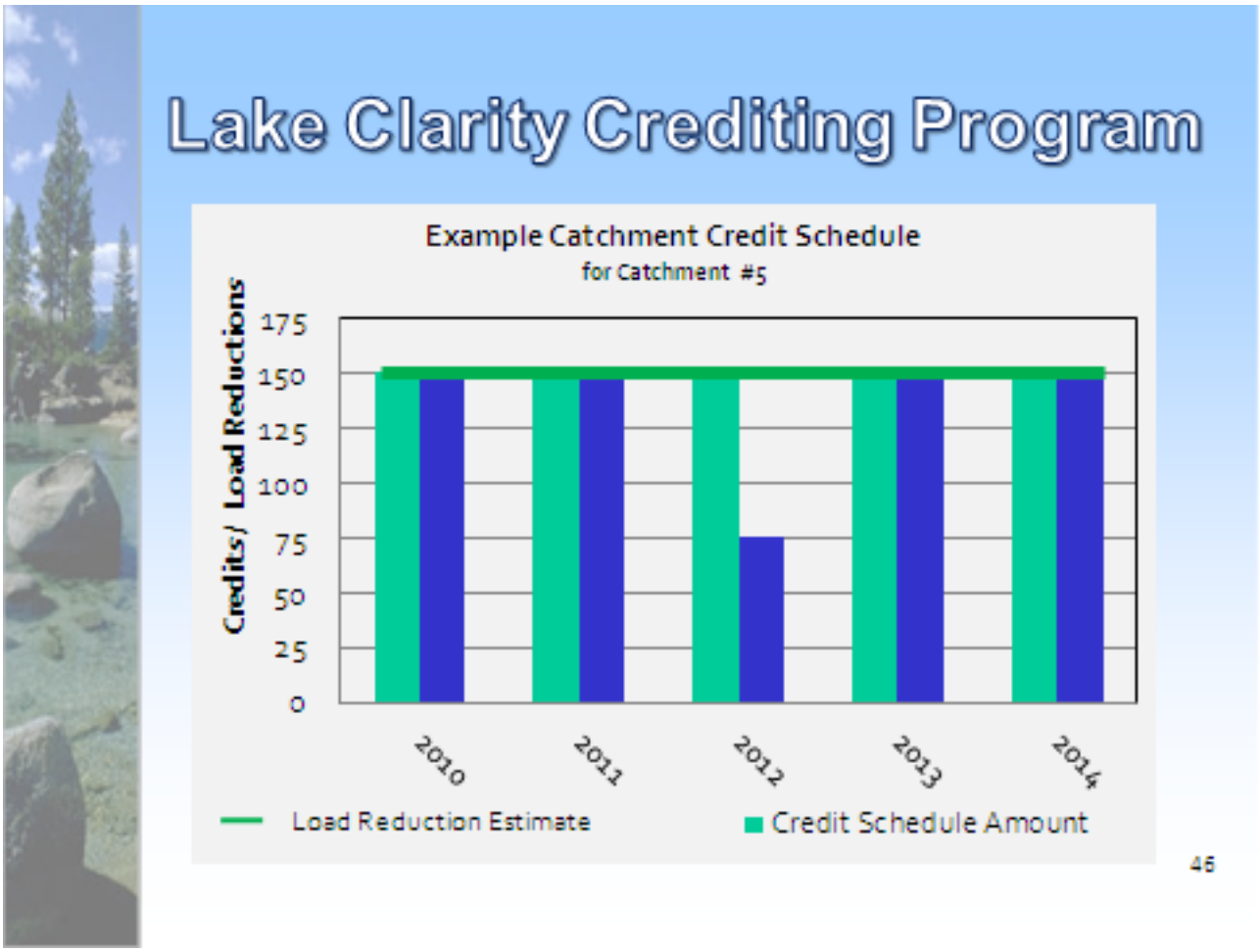
The process results in a catchment credit schedule for a period of time to be claimed (and justified) by the jurisdiction.



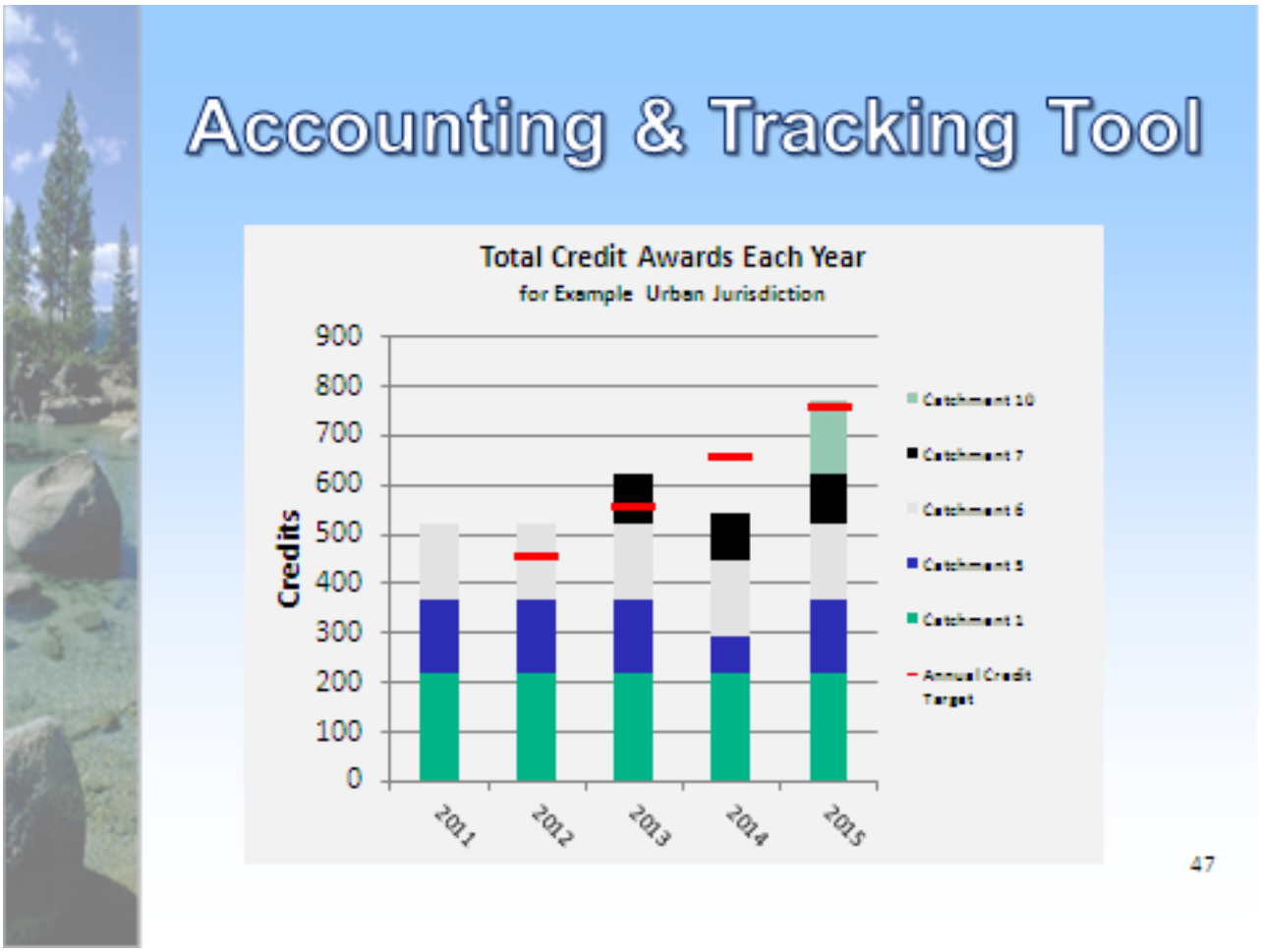
Rapid Assessment Methodologies are standardized, simple and repeatable field observation protocols and associated data management tools that assist Tahoe Basin resource managers in determining the relative condition of stormwater treatment BMPS and impervious road surfaces.



RAMs are used for a number of different purposes. RAM scores are assigned based on a standardized 1-5 scale (5 = great, 1= bad, <2 indicates in need of maintenance). After conducting inspections, jurisdictions enter the scores into the database.

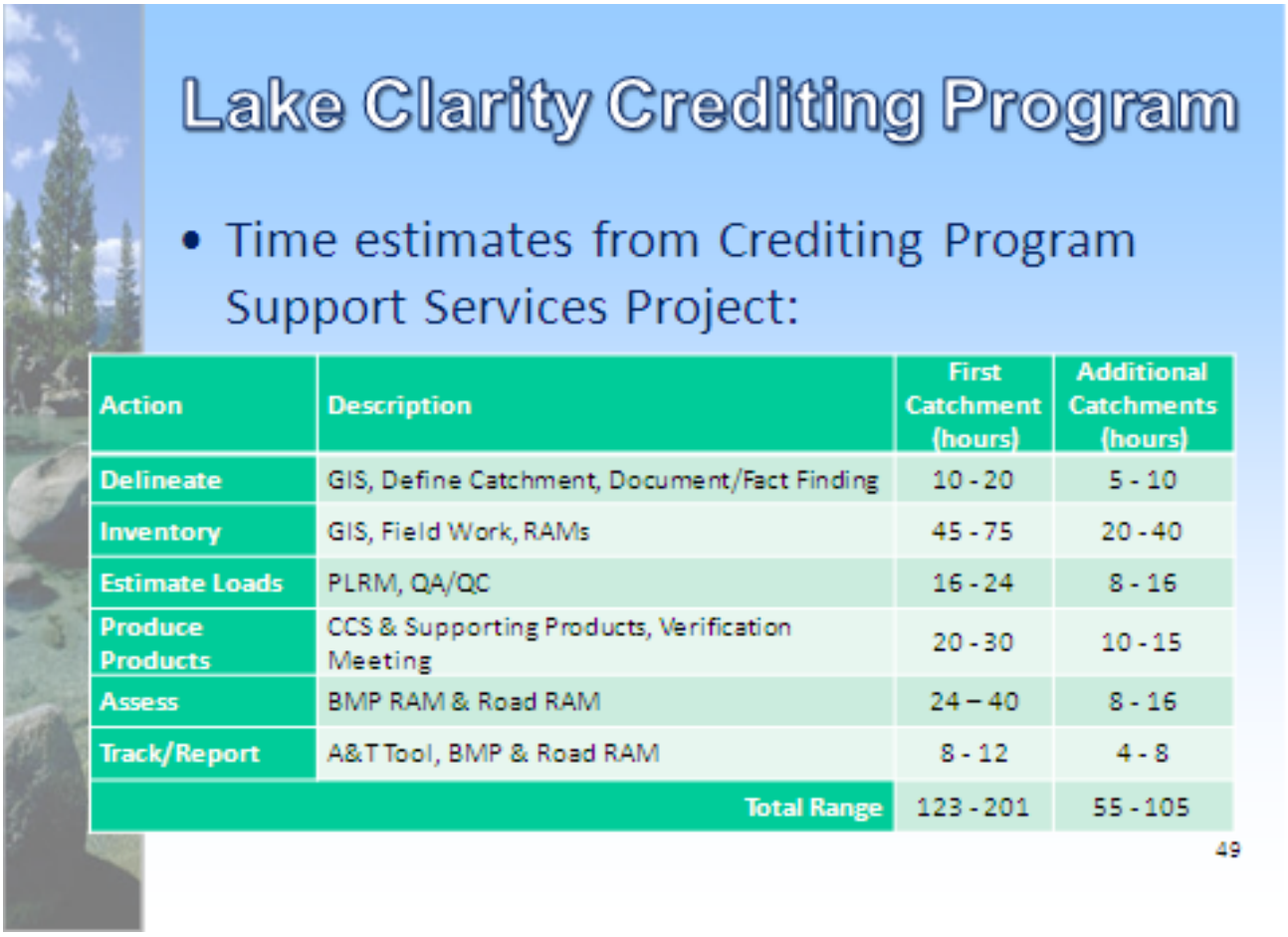


How does the Crediting Program use the RAM scores? Credit is awarded based on condition roadways and BMPs. Therefore, full credit is received when these assets are maintained in appropriate functional condition (RAM > 2). When RAM score is < 2, the condition of your assets is unacceptable to receive the full credit potential, and you will be docked credit – see year 2012 as an example when the jurisdiction did not maintain treatment BMPs and roadways in appropriate condition.

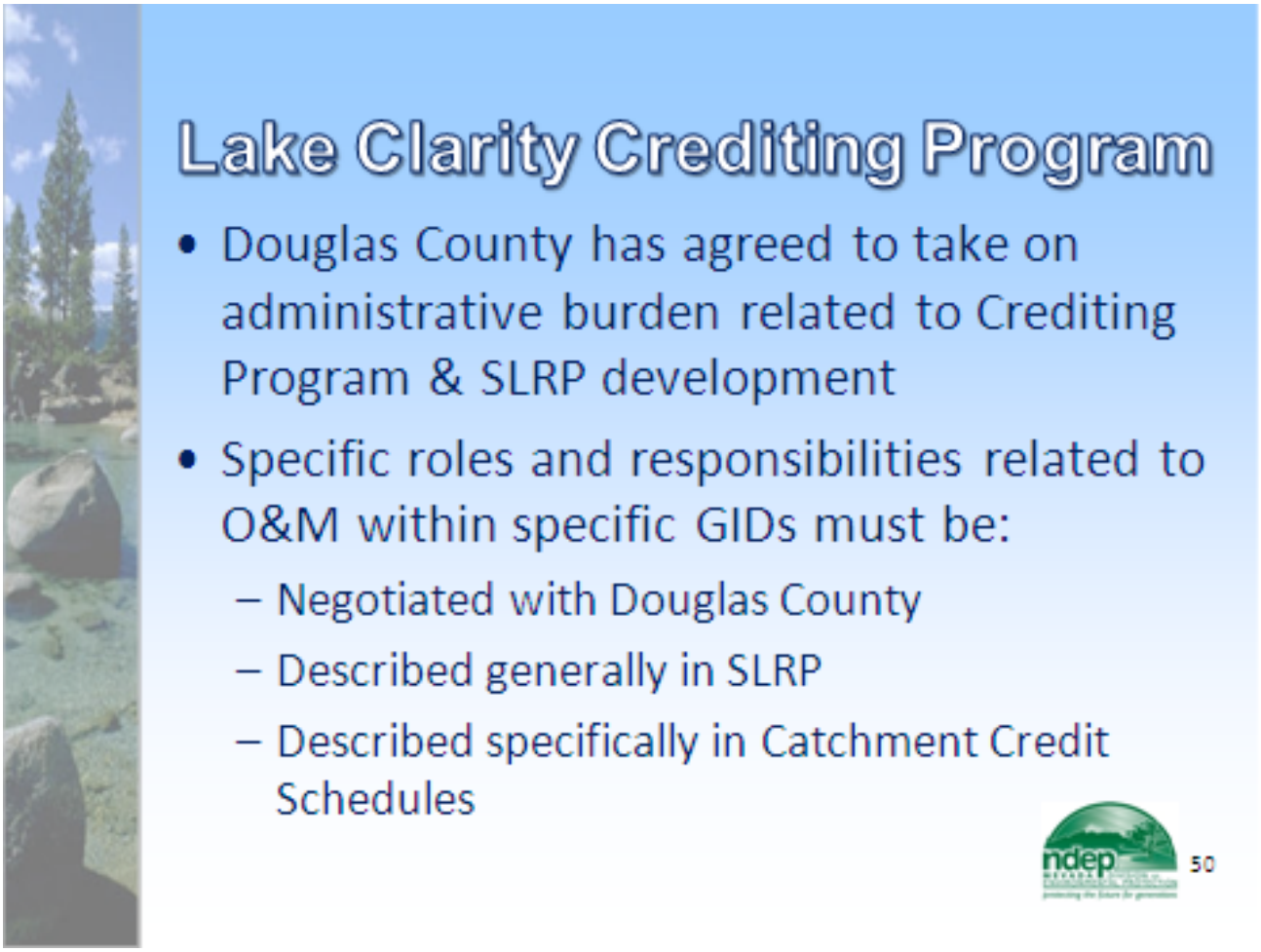


The Accounting and Tracking Tool (A&TT) is the central tracking and reporting database system for the Crediting Program. All the Crediting Program information and data is entered into the A&TT system by the jurisdiction. It in turn assembles the information and generates progress reports - at the individual jurisdiction scale…

and at the basin-wide scale. So the Crediting Program is the tool that drives accountability for the moneys received to protect and restore water quality and the A&TT is the reporting tool that enables us to shows & evaluate progress.



This table shows time estimates for carrying out the Crediting Program (ie., catchment registration project). These estimates were derived through the Crediting Program Support Services project, which is a current project aimed at walking the 7 major urban stormwater jurisdictions across the Lake (counties, City of South Lake Tahoe, NDOT, CalTrans) through the crediting program. Due to limited resources, the GIDs were not invited to participate in this project.



The Crediting Program represents an administrative requirement that the GIDs are not likely to be able to accomplish on their own. Fortunately, Douglas County has accepted to take on this role for the Tahoe Douglas region.

NDEP would like to receive verbal commitment tentatively by end of fiscal year (June 30, 2011).

NDEP will begin working on the draft MOA language in the summer at which time it is expected the SLRP will be initiated as well.

LAKE TAHOE FINE SEDIMENT PARTICLE, NITROGEN & PHOSPHORUS TOTAL MAXIMUM DAILY LOAD

GID COORDINATION

Mahmood Azad, PE

County Engineer

15th March 2011

BACKGROUND

- NDEP will accept the FSP, N & P TMDL (late 2012 to early 2013)
- NDEP will utilize a MOA approach rather than a permit process
- GIDs may be signatories to a combined MOA with the County
- NDEP requests that the County lead and assist the GIDs with the TMDL

INFORMATION

- TMDL catchments must be registered with NDEP
- Scheduled, auditable maintenance of catchments are necessary to obtain TMDL credits
- TMDL credits can also be obtained by timely sweeping of roads with advance sweepers
- If catchments are not registered or maintained the MOA can be revoked and a discharge permit can be issued

IN PREPERATION OF COORDINATED TMDL WORK

- County has paid for and developed technical capacity to model and register catchments
- County will map WQIPs and EIPs for all jurisdictions within the County at the Lake
- County will develop an automated maintenance management system that the GIDs may want to use

KNOWN COSTS

- Cost to model and register a single catchment is approximately $17,000 each
- Maintenance and administration annual average cost for a single catchment is $15,500 per year