Rapid Assessment Method Survey Forms
(Nutrient and bacteria focus)

SITE INFORMATION			
Survey Area	Date	Time	
Waterbody	Site Name	Evaluator	
Upstream end	latitude	longitude	NAD
Downstream end	latitude	longitude	NAD
General description _____			
Property owner	Contact info:		

WEATHER AND FLOOD CONDITIONS	
Current weather	□ Sunny □ Partly cloudy □ Overcast □ Light rain □ Moderate rain □ Heavy rain □ Other _____
□ Not raining at this site, but rain upstream may be impacting site	
Precipitation in last 48 hours	□ None □ Light □ Moderate □ Heavy □ Snow or sleet
Flood events during last 4 weeks	□ None □ Field evidence (e.g., fresh debris, grasses laid over, fresh bank erosion) Documented by □ Newspaper □ Person _____ □ Currently flooding
□ Drought conditions prevailing	Last significant rain _____

WATER OBSERVATIONS	
Clarity	□ Clear □ Turbid □ Stained □ Opaque □ Oily □ Other (chemical, dyes)
Color	□ Clear □ Brown □ Grey □ Yellow □ Green □ Orange/Red □ Other
Odor	□ None □ Fishy □ Sewage □ Chlorine □ Rotten eggs □ Other _____
Dominant substrate	□ Silt/sand □ Gravel □ Cobble (3-10") □ Boulder □ Bedrock
Aquatic plants coverage	□ 1% □ 2-25% □ 26-50% □ 51-75% □ 76-100%
Algae coverage	□ 1% □ 2-25% □ 26-50% □ 51-75% □ 76-100%
Macroinvertebrates	□ Absent □ Rare □ Common □ Abundant
Crayfish and bullfrogs	□ Absent □ Rare □ Common □ Abundant

FLOW REGIME	
Current flow	□ No flow □ Pools □ Trickle □ Low □ Moderate □ High □ Flood
Flow (check only one)	□ Perennial – Persists all year □ Intermittent – Dries out part of the year or flows only a few weeks □ Ephemeral – Flows only in response to precipitation □ Interrupted – Flows only in a portion of this reach
Issues affecting flow	□ Seasonal variation primarily due to snow melt □ Uniform flow due to spring sources □ Flow primarily from treated effluent discharges (permit) □ Regulated flow – dam releases, diversions □ Altered flows due to ground water pumping □ Water transfer provides water from another drainage

WATER SAMPLES AND MONITORING		
	Above _____	Below _____
Dissolved oxygen (if flowing)	_____ mg/L Method _____	_____ mg/L Method _____
pH (if flowing)	_____ SU Method _____	_____ SU Method _____ _____
Other		

RIPARIAN AND STREAM BANK CONDITIONS		
Elevations and riparian associations	□ Below 3280 ft elev. – Sonoran, Chihuahuan, Mohave, Great Basin □ 3280-5740 ft. elev. – Interior – Cottonwood-willow and mixed broadleaf □ 5740-8200 ft. elev. – Montane – Mixed broadleaf □ Above 8200 ft. elev. – Boreal – Sub-alpine forests	
Width of vegetated riparian ground cover or active riparian filter strip (grasses, shrubs, etc under 2 feet)	LEFT BANK* □ Less than 10 feet wide □ 10-30 feet wide □ 30 or more feet wide	RIGHT BANK* □ Less than 10 feet wide □ 10-30 feet wide □ 30 or more feet wide
Percent ground cover (grasses, shrubs, etc under 2 feet) **(Use field chart)**	LEFT BANK* □ 5 – 30% □ 40-60% □ more than 60%	RIGHT BANK* □ 5 – 30% □ 40-60% □ more than 60%
Average stream bank slope x feet rise/100 feet = y percent slope	LEFT BANK* _____ percent slope	RIGHT BANK* _____ percent slope
Stream bank stability	LEFT BANK* □ Stable slope with good cover □ Bank angle □ Stormwater causing erosion □ Minor □ Moderate □ Abundant Approximate % of bank _____	RIGHT BANK* □ Stable slope with good cover □ Bank angle □ Stormwater causing erosion □ Minor □ Moderate □ Abundant Approximate % of bank _____
Trash and debris	□ Not observed □ Minor □ Moderate □ Abundant □ Primarily plastic bottles □ Food wastes □ Chemicals □ Large items	

* **Left and right bank are determined looking <u>downstream</u>**

EVIDENCE OF POLLUTANT LOADING Within 150 feet of the surface water		
Urban/subdivision	□ Storm water causing erosion □ Drainage from trash receptacles □ Inadequate riparian buffer	□ Runoff from lawns □ Pet wastes Notes *_____
Waste water disposal	□ Sewered □ Sewer line crossing stream □ Drainage from sewer lines likely □ Treated effluent (golf, discharge)	□ Septic system survey form Notes *_____ _____
Livestock operations	□ Drainage from corrals, pastures, or feedlots □ Inadequate riparian buffer □ Animals have access to stream (lack of fences, animals in water)	□ Lack of alternative water sources □ Animal waste □ Minor □ Moderate □ Abundant Notes *_____ _____
Crop production	□ Drainage from fields □ Irrigation return flows □ Inadequate crop filter strips	**Notes*** _____ _____
Recreation	□ Toilet facilities inadequate* □ Toilet facilities not maintained* □ Human waste observed □ Inadequate riparian buffer □ Pet wastes	□ Marina / boat wastes □ Feeding wildlife (ducks & geese) □ Trash facilities inadequate* □ Trash – wildlife interactions **Notes***_____ _____
Fire damage	□ Fire within last 3 years at site □ Fire 3-7 years ago at site	□ Within last 3 years in watershed □ 3-7 years ago in watershed

ATTACHMENTS		
□ **Site Sketch**	□ Photo Inventory	
□ Septic System Survey Form	□ Other Documents	

* **Note distance from surface water and likelihood of contribution. Judge "adequacy" based on peak use periods, discussions with people maintaining facilities, discussions with users, and observations.**

Field Equipment

100 foot measuring tapes or ability to accurately pace off distances
Bank angle indicator and meter stick/yard stick (for bank slope calculations)
Camera and Photo Inventory Form
GPS
Dissolved oxygen and pH equipment
Field survey forms
Septic system survey forms (Still need to develop this)
Field maps of "survey area" where sites are accurately denoted as they are visited
Field chart for percent ground cover
Calculator for percent rise
Pens, pencils, and clipboards
Appropriate apparel, drinking water, first aid kit
Field identification for volunteer (name or volunteer, official contact phone number, etc)

Site Information

This section is needed so that anyone could find the site again, and so that land owner can be identified and contacted if necessary. Describe site using information that will not change over time. Provide more access information where it will be necessary (roads, who to contact, etc)

- Survey Area name would be established in the monitoring plan
- Record date as: mm/dd/yyyy
- Record time when arrive at site
- Provide a site name – landowner, nearby crossing, (e.g., Verde River downstream of Park Lane)
- Provide descriptive name for upstream and downstream end of segment/site. (e.g., Top of Reach (TOR) at north fence, Bottom of Reach (BOR) at road crossing).
- GPS
    - Be sure that GPS unit is working at beginning of each day.
    - Set GPS unit to NAD 83.
    - Record latitude/longitude as degrees, minutes, and seconds to the thousands (nn nn nn.nnn) or in decimal degrees (nn.nnnnnn)
- Determine landowner name and contact information either by making contact in the field or by research back at the office.

Weather and Flood Conditions

Field observations will be interpreted using information about current and recent past weather conditions. In particular droughts and storms will intensify nutrient symptoms observed. For example:

- Algal blooms are likely to occur soon after a flood event due to brief periods of nutrient enrichment from the watershed
- Nutrients may concentrate in surface water during droughts, especially if continued source contributions or in pooled water lacking adequate flow through.
- Nutrient recycling (sediments → plants → decaying plants → sediments) may be the major source of nutrients, especially in a relatively static lake system.
- Fecal matter deposited along the stream bank will be washed away during heavy rains and flood flows.
- *E. coli* bacteria concentrations are normally above Arizona's water quality standards during first flush of flood waters.

Water Observations

Observations are combined in a "weight-of evidence" approach with other field information to determine excessive nutrient loading. A single line of evidence is seldom sufficient.

- Clarity – turbid, stained, opaque, oily. (Note that small amounts of oily sheen may naturally occur in backwater areas due to break down of plant material, and may not indicate excessive nutrients.)
- Color – brown, grey, yellow, green (from algae), orange/red. Green from copper chemicals or dyes would not be evidence of nutrient enrichment.
- Odor – fishy, sewage, rotten eggs, chlorine, and some other smells
- Substrate – sand/silt frequently indicates excess erosion (from watershed or stream banks) which may be loaded with nutrients. If silt and sand is a dominant substrate, consider quantifying it using ADEQ's "Pebble Count" methods (see follow=up monitoring).

- Aquatic plants – Larger percentages of aquatic plants
- Algae – Larger percentages of filamentous green algae cover
- Macroinvertebrates – Abundance of macroinvertebrates
- Crayfish and bullfrogs – Both will consume macroinvertebrates

Flow Regime

Field observations and potential mitigation methods will also be interpreted by information concerning flow regime. For example:

- Some flows are created by primarily by ground water upwelling which is naturally low in dissolved oxygen, an indicator parameter used to evaluate nutrient loading.
- Nutrient introduction is limited to runoff events in ephemeral streams.

Although on the field form, information will need to be researched. Field volunteers will only be able to determine current observed flow in the field.

Water Samples

It is important to collect measurable data where appropriate. This data can be used to identify sources by comparing values collected above and below a potential discharge area. In most cases nutrient discharges will be occurring only during specific conditions (e.g., runoff events). Samples collected at "key sites" can be used to determine success over time.

- Dissolved oxygen (DO) and pH should be collected at sites with *flowing* water, not in stagnant pools. Collect where flow is greatest, not along edge. Combined in a weight-of-evidence approach, these parameters can be used as indicators of excess nutrient enrichment.
    - Low DO = below 7 mg/L in coldwater (Oak Creek above Slide Rock, Granite Creek above Watson Lake), or below 6 mg/L in warmwater (Oak Creek at Slide Rock and below or San Francisco River).
    - Excess nutrients can be indicated by pH above 9.0 SU.
    - Low DO and high pH are normal in stagnant pools. Low DO is normal in streams with ground water upwelling.

Riparian and Stream Bank Condition

This is a qualitative quick evaluation of riparian conditions to be added to the "weight-of-evidence" approach to determine if inadequate filtering of runoff may be contributing to excess nutrients. The Proper Functioning Condition evaluation is more quantitative and reproducible (see discussion in "follow-up monitoring."

- Elevations and riparian associations – indicates broadly the type of reference condition. For example, riparian areas in the Mohave Desert simply will not develop a riparian area that looks and acts like a healthy riparian area along the Mogollon Rim.
- It will be necessary to identify "reference sites" and measure conditions in those sites to properly evaluate all other sites.
- Filtering capacity of the riparian area is a combination of several factors. We are measuring the first three of these:
    - Depth of the vegetated area (the filter strip or buffer strip)
    - Slope of stream bank
    - Type and quality of vegetation – percent ground cover
    - Intensity of rain event
    - Amount of fines already in the vegetative filter

  For example, a study in Iowa showed that on a 7-12% slope, 10 feet of vegetation filtered out 70% of the sediment, and 30 feet filtered out 95%. Nutrients and bacteria are transported with the sediment.
- The stream bank itself can be a source of nutrient loading. We are providing a rough evaluation of stream bank stability. If this becomes a "key site," further measurement of stream bank stability are recommended,
- Bank slope greater than 45 degrees may indicate bank instability. Bank slope is determined at the 3-year flood level (bank full), and is an estimated average of the slope for a given length of stream.

Evidence of Pollutant Loading

This is direct evidence of pollutant loading. However, it is principally qualitative and not quantitative; therefore it is added to the other evidence collected to determine potential nutrient/bacteria source contribution and potential remediation sites. Follow-up monitoring should be considered at sites with significant evidence of pollutant loading.

- Measure distance from edge of water where possible and appropriate.
- Document these using photographs and these field notes, attaching other information when available.
- Do follow-up monitoring at sites to further document source contributions. Some impacted sites will become project sites or "key sites" where baseline documentation of impacts can provide clear evidence of success in the future.

Follow-up Monitoring

Follow-up monitoring should be completed at some sites to determine sources and develop baseline measurements at "key sites" and "reference sites."

Each of these methods requires additional field equipment and follows specific protocols.

- ***E. coli* bacteria** should be collected at sites with *flowing* water. Note that samples collected during flood flows with turbid water and first flush of storm water events are usually contaminated. Samples collected after a runoff event, but with low or normal turbidity are best for establishing baseline data and for determining the effectiveness of watershed improvements.
- **Proper Functioning Condition (PFC) of the Riparian Areas** (using USFS/BLM protocols) are very useful for determining effectiveness of many watershed improvements. They are relatively qualitative (subjective) and require trained investigators, with a level of expertise so that evaluations can be judged consistent over time and at different locations.
- **Pebble counts** can be used to determine excessive bottom deposits, which may contain nutrient loads from the watershed. This would be valuable measurement at key sites where sedimentation has been observed. Use ADEQ protocols, which require a minimum of 300 feet of stream reach.
- **Bank Erosion Hazard Index (BEHI)** of a stream bank may be used to further quantify stream-bank erosion. Use ADEQ protocols.
- **Biocriteria** are useful where working in wadeable, flowing, perennial streams. Use Arizona's Biocriteria standard (when adopted) and Indices of Biological Integrity and ADEQ's protocols. ADEQ is also investigating the use of biocriteria on intermittent streams. Data collected on intermittent or perennial streams may be useful for determining effectiveness of watershed improvements.
- **Algal and aquatic vegetation identification, turbidity measurements, flow measurements, and nutrient samples** may also be useful. How useful will depend on the site, as many factors must be considered. The usefulness is also dependant on being able to test accurately at a low enough concentration.

Septic System Survey Form

Still need to make this form, but the form would include the following items:

Type of system
Age of system
Design approved and on file _____

When septic system last pumped?
Frequency of pumping?
Frequency of maintenance? Repairs?

The septic tank and leaching system location
- Distance from surface water or wash
- Slope
- Type of soil (clay, mixed loam, gravels
- Distance to well water (theirs and their neighbors)

Evidence of discharge: _____

Photo Inventory

SURVEY AREA	DATE	EVALUATOR
LOCATION*	**PHOTO #**	**DESCRIPTION**

*Location could be surface water or property owner or lot number.
Add further details in your field notes.

Percent Ground Cover