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Randy Johnson, P.E.

Experience: 15 Years • Joined Firm: 2004 • Professional Registrations: Idaho #11502,
Washington #39358, Nevada #21294, Wyoming #13457

Assignment

Water Resources Project Manager – Forsgren Associates, Inc.

Education

B.S., Civil Engineering, University of Idaho
M.S., Civil Engineering, University of Idaho

Presentations

Using Sediment Transport Capacity to Predict Geomorphic Effects of Flood Mitigation Alternatives, presented by Garrett Jackson and Randy Johnson at the November 2004 Conference of the AWRA.

Integrated Water Resource Management Plans, 2011 Virgin Valley Water District, Mesquite, NV

Options in Water Treatment, Presented at IRWA, 2009 annual Technical Conference, Idaho Falls, ID

Certifications

State of Idaho Certified Water Right Examiner

Relevant Expertise

Hydraulic structures and channel stabilization design, Stream habitat and fish passage design, Hydraulics and hydrologic design and analysis; Geomorphology and sediment transport analysis

Summary

Randy is a civil/water resources engineer and fluvial geomorphologist with more than 15 years of experience in hydrologic, hydraulic, and geomorphic analysis and design for irrigation systems, habitat restoration, bank stabilization, geomorphic assessment, and floodplain mapping projects. He has completed designs for hydraulic and flow control structures, scour protection, bank stabilization, habitat restoration, and channel reconstruction projects. He conducts hydrologic and hydraulic analyses using models such as HEC-RAS, UNET, HEC-HMS, StreamStats, USGS NFF, StormCAD, and NRCS TR-55. His experience also includes geomorphic and sediment transport studies to evaluate river system aggradation, degradation, or channel migration and localized scour or deposition at hydraulic structures, one of which he presented at a national AWRA conference. Randy's experience and expertise include flood plain analysis and watershed studies.

Selected Experience

Irrigation System Improvements, Muddy Valley Irrigation Company, Logandale, NV. Mr. Johnson has provided design and engineering assistance for maintenance and improvement of Muddy Valley Irrigation Company (MVIC) infrastructure. He completed modeling and senior technical review of the design for replacement of over 2 miles of concrete lined ditch with a 30-inch pipe. As part of the preliminary engineering, he completed an evaluation of hydropower potential at the request of the local power company. The system design allows for the pipeline to function as a hydropower penstock and for the addition of a hydropower facility at the downstream end of the irrigation line. This imposed the unique design challenges of a pipeline that is to function both as a low head irrigation delivery system and as a high pressure penstock. Design elements included pipe and control valves, energy dissipation structure, and outfall protection at the discharge point to a river. He has completed modeling and design for another half mile of other canal to pipe conversion projects and pipe replacement projects at various locations in their delivery system. These efforts have included design of pipelines, valves, and siphon structures.

Bowman Reservoir permitting and maintenance, Muddy Valley Irrigation Company, Logandale NV. Mr. Johnson has provided engineering support for MVIC related to the permitting and maintenance of Bowman Reservoir, a 4000 acre-foot off-channel storage reservoir. As part of an update to the Emergency Action Plan for the reservoir, he prepared inundation mapping to evaluate the potential extent of flooding in the event of a reservoir breach of Bowman Reservoir. The effort included development of a dam break hydrograph and a non-steady state hydraulic model, then routing the hydrograph through the downstream valley and river system to estimate potential extent of inundated area, flood depths, velocity and wave travel

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time. Results were used to develop GIS based inundation mapping which shows to anticipated conditions. In addition to hydraulic analyses, he also provided engineering support for completion of improvements to the company's water storage reservoir. He developed hydraulic design parameters for modifications to the intake structure for the reservoir discharge pipe and provided technical review of proposed plans for modifications to a retaining wall on the inlet structure for the upstream reservoir inlet pipe. He also provided technical review for a pressure grouting effort to repair a leaking inlet pipe.

Culinary Water Hydroelectric Project, Afton, WY. Mr. Johnson was the project engineer for the Afton Culinary Water Hydroelectric Project, a 225 kW facility constructed as a diversion on the water supply pipeline from Periodic Springs adjacent to the water storage reservoir. Mr. Johnson was the principal design engineer involved with performing the hydraulic calculations and developing the design for the penstock, turbine building, outfall, and chlorination facilities. Randy's efforts led directly to completing design documents for the hydroelectric facility and submitting them to the Wyoming Dept. of Environmental Quality within 30 days. Subsequent design and contract development effort resulted in obligation of funds by the ARRA deadline.

Sterling Wildlife Management Area Stream Restoration; Sterling, ID. Randy completed the hydraulic analysis and restoration design for stream channel relocation in the Sterling Wildlife Management Area (WMA). A drainage ditch with limited habitat value crossed a land owner's property en route to the American Falls Reservoir. The land owner and Idaho Fish & Game agreed to reroute the drainage through the Sterling Wildlife management Area to enhance waterfowl habitat conditions. Randy coordinated survey data collection, completed in-stream flow measurement and a site assessment of channel conditions. He then developed a HEC-RAS model of the existing drainage network and a proposed channel. The new channel will convert an isolated drainage of limited habitat value to a ½-mile of functioning stream interconnected with the WMA habitat system. Upon approval of the design, he will complete the construction administration of the project.

Little Salmon River Bank Stabilization and Geomorphologic Assessment; Adams and Idaho Counties, ID. Randy completed hydraulic engineer design review and geomorphic analysis for the Little Salmon River Bank Stabilization and Geomorphologic Assessment. To mitigate a scour critical segment of US-95 near the Pinehurst Resort on US-95 on the Little Salmon River, developed a scour countermeasure design utilizing rock stream barbs with incorporating Large Woody Debris to protect the embankment and provide salmonid habitat. Our effort included a geomorphic assessment of the Little Salmon River system to provide review agency personnel from NOAA Fisheries, USFWS, USACOE, and IDWR, with an assessment of the potential impacts of the proposed stabilization measures on the river system. Randy completed the assessment and determined that the project would have limited effect on the geomorphology of the Little Salmon River.

U.S. Bureau of Land Management; Lee Creek Culvert Replacement, Roseburg District, OR. As part of a fish passage assessment of an existing water crossing, evaluated existing creek and culvert conditions to determine potential fish passage issues. Provided technical review of proposed grade control structures and culvert design. Performed hydraulic analysis with proposed modifications to verify that fish passage requirements were met.

West Pine Creek Channel Restoration and Bridge Replacement, Bonneville County, ID. Mr. Johnson is assisting the Idaho Transportation Department (ITD) and U.S. Forest Service (USFS) in their efforts to re-establish natural channel conditions for West Pine Creek near Swan Valley, ID. The project objective is to replace a failing bridge and in the process divert West Pine Creek back into its natural channel to improve stability and function. Mr. Johnson has completed a preliminary design of the restored alignment, coordinated a channel and flood plain survey to identify potential channel reaches and wetland restoration opportunities, determined hydrologic conditions, and prepared a hydraulic model of the existing and proposed stream channels. Utilizing this information, he completed a geomorphic assessment, scour analysis, and design of

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the new channel to meet habitat objectives for the channel, floodplain, and wetland areas, and structural stability for the proposed structures.

City of Lincoln City; Drift Creek Water Supply Intake Hydraulic Assessment, Lincoln City, OR. Performed a hydraulic and geomorphic evaluation of Drift Creek to provide support information for design and permitting of a new water supply intake. Completed a watershed evaluation to determine stream flows and sediment supply, prepared a hydraulic model of the freshwater and estuarine reaches of the creek, and estimated potential sediment transport and scour / deposition at the proposed intake and other hydraulic structures. Provided design recommendations for, and reported potential impacts to stream habitat due to installation of the proposed water supply intake.

Lion's Club of Renton, Cedar River Side Channel Habitat Enhancement, Renton, WA. Designed a side channel to provide rearing habitat for juvenile Chinook salmon habitat in the Cedar River. Developed design criteria for the proposed side channel. Developed a HEC-RAS model to characterize hydraulic conditions in the Cedar River at the project site. Prepared a conceptual design for the side channel which included reconnection of the side channel with the River during target flow periods, construction of an inlet control structure, and placement of habitat structures in the side channel. Performed hydraulic analysis of the side channel and the inlet structure and adjusted the design to meet our established criteria for channel stability and habitat requirements. Also performed a structural analysis of the inlet control structure. Developed a set of construction drawings based on the conceptual design and results of design analyses.

Skagit County; Wiseman Creek Restoration Conceptual Alternatives Plan, Sedro-Woolley, WA. Performed hydrologic analysis of contributing watershed, and hydraulic and sediment transport capacity analysis of selected stream reaches and bridges. Developed design alternatives for creek restoration.

Palouse Clearwater Environmental Institute, Paradise Creek Stream Restoration, Hydraulic Analysis, Moscow, ID. Performed hydrologic and hydraulic analysis of stream channel system and prepared grading and channel form designs for new meandering channel to replace straightened incised channel.

Madison County, Lenroot Canal Co., South Fork Snake River Geomorphology and Stabilization Assessment, Madison County, ID. Provided hydraulic and geomorphic analysis and design to public and private entities working to establish long term channel stability and habitat function in a reach of the South Fork of the Snake River south of Archer Idaho. A shift in location of this highly dynamic river is leading to instability in the reach of this highly prized trout fishery, and has put critical transportation and irrigation infrastructure in jeopardy. Designed and oversaw implementation of an innovative stabilization design that allowed construction adjacent to a 25 foot scour hole without the use of a coffer dam, thus facilitating faster construction and less environmental impact. Designed downstream bank stabilization and habitat improvements and obtained the necessary Corp of Engineers and IDWR permits. Coordinated river corridor surveys and performed geomorphic assessment of potential remedies. Prepared application and engineering support data for funding applications for replacement bridge.

U.S. Forest Service/Madison County, Ruby Creek Bridge Replacement, Caribou-Targhee National Forest, Madison County, ID. Completed design of a bridge replacement and restoration of associated stream channel for an existing timber structure over Ruby Creek. Performed hydraulic analysis of the creek to determine bridge and scour protection design parameters. Prepared bridge plans in accordance with U.S. Forest Service and Madison County design requirements. Design included establishment of low flow channel and floodplain areas to improve fish passage and habitat conditions.

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U.S. Army Corps of Engineers, Skookumchuck River Geomorphology and Sediment Transport and Habitat Evaluation Study, Centralia, WA. Served as project manager for a geomorphology and sediment transport study to assess habitat impacts of flood mitigation on the Skookumchuck River. Performed aerial photo analysis to evaluate historic channel form, identify locations of channel instability, and evaluate the extent of channel migration. Coordinated field reconnaissance to determine points of erosion and deposition, evaluate channel migration, and collect sediment samples. Manipulated existing, large-scale UNET model to evaluate effects of different dam operation scenarios. Developed sediment transport model to estimate transport capacity, potential sediment load, and effective discharge from project reach sediment data and hydraulic analysis results from a UNET model. Used the results of the aerial photograph analysis, field reconnaissance, and sediment transport modeling to evaluate the current sediment transport regime, likely response to changes in hydraulic conditions, and associated change in physical habitat conditions. Prepared a report to describe the potential effects dam operation scenarios on the stability and function of the river.

Shasta Valley Resource Conservation District; Araujo Irrigation Diversion Improvements, Yreka, CA. Performed river system hydraulic modeling to determine hydraulic conditions associated with a dam removal and irrigation diversion consolidation in an effort to improve fish passage. Provided senior design review of proposed in-stream rock ramp grade control structures for fish passage and scour protection measures at in-stream structures and diversions.

U.S. Army Corp of Engineers, Housatonic River Remediation Project, Hydrologic/Hydraulic Analysis, Pittsfield, MA. Performed hydrologic, hydraulic and scour analysis, and channel armor design as part of the Housatonic River remediation design. Developed peak storm flows from stream gage data using the Log Pearson III and Partial Duration analysis and distributed flows along the reach by comparative area. Developed HEC-RAS model and evaluated the potential effects of remedial activities on flood stage and sediment mobility. Assessed the potential for river bed and bank scour due to remedial activities, and to permanent structures (rock deflectors, culvert outfall). Designed bed and bank stabilization measures, and habitat features to be incorporated into the final construction. Prepared specification sections associated with armor layer, earthwork, and sedimentation/erosion control. Prepared Basis of Design report related to the hydrologic, hydraulic, and bed and bank protection analyses.

U.S. Army Corp of Engineers, Skagit River Geomorphology and Sediment Transport Study, Mount Vernon, WA. Performed field work and preliminary analysis in support of a detailed geomorphology and sediment transport study of the Skagit River. Collected samples of bed material from gravel and sand bars. Performed field reconnaissance of river conditions (flow depth, channel form, near bank vegetation, etc.). Sampled sediment from the river bed using a boat mounted BM-54 bed material sampler, logged samples, and transported samples to laboratory for grain size analysis. Performed preliminary evaluation of sediment transport potential through a conceptual bypass channel. This included estimation of sediment supply, calculation of sediment distribution in the water column, and estimation of sediment transport capacity through the channel. Provided technical oversight regarding transport analysis for mainstem including evaluation of appropriate representative gradation, and assisted in development of HEC-6 sediment transport model.

U.S. Army Corp of Engineers, Chehalis River Geomorphology and Sediment Transport Study, Chehalis, WA. Performed field work and sediment transport analysis in support of a geomorphology and sediment transport study of the Chehalis River. Performed field reconnaissance to determine points of erosion and deposition, and evaluate channel migration and function. Estimated local sediment input rate based on estimated channel migration rates. Developed sediment transport model to estimate transport capacity and potential sediment load from project reach sediment data and hydraulic analysis results from a UNET model. Model was used to estimate transport potential for a range of grain sizes, under hydraulic conditions that would result from a set of flood mitigation alternatives. Used the peak capacity and total load estimates to evaluate the overall river capacity and likely response to changes in hydraulic conditions. Prepared a report that combined the geomorphology information from the field

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reconnaissance and historical records with the outcome of the transport modeling to describe the potential effects of the proposed modifications to the channel.

Bancroft Floodplain Study and Map Revision, Bancroft, ID. Performed a floodplain study and prepared the necessary submittals to request a Letter of Map Revision (LOMR) from FEMA to reduce the floodplain area within the City of Bancroft by approximately 80% for an unnamed tributary to the Portneuf River. Worked with FEMA hydrologists and hydraulic engineers to define methods and assumptions for our analyses prior to completing specific phases of the study. We performed a hydrologic study for the 80 square mile drainage basin, estimated the 100-year peak flow, and completed the hydraulic modeling of the City drainage system.

Kingston Properties, Henry's Fork Bank Stabilization Design, Madison County, ID. Completed hydrologic and hydraulic analysis and design for stream bank stabilization project on the Henry's Fork of the Snake River. Completed hydrologic analysis to determine design flow rates and a hydraulic analysis to estimate potential scour depth and shear stress in a river bend. Evaluated potential bank stabilization method based on estimated shear stress, flow velocity, and water surface elevation estimates. Prepared design that included bank height reduction to improve floodplain connectivity, rock toe design, and vegetated stabilization components. Provided documentation for permitting and coordinated with agencies to obtain approval of proposed design.

Watershed Hydrology and Surface Erosion Analyses – Eel River Basin, Fortuna, CA—Mr. Johnson was a member of the technical team that completed the watershed analysis to support modifications to timber harvest practices and guide development of timber harvest plans in the redwood forests in the Eel River watershed. He prepared the Surface Erosion Module and completed modeling for the Hydrology Module of the watershed study. The comprehensive watershed study included multiple different modules including mass wasting, surface erosion, mass wasting, geomorphology, fisheries, and amphibian biology. This effort required a high level of team coordination between engineers, scientists, biologists, geologists, regulatory agencies, and local stakeholders. A critical part of this effort was the presentation of technical data and recommendations to the watershed regulatory review board which consisted of numerous local, state, and federal agencies as well as industrial and environmental interests. His technical effort provided an estimate of the quantities and processes contributing surface sediments to streams, and potential methods for reducing these inputs. He coordinated with regulatory board and other watershed professionals to evaluate representative creep rates and appropriate methods and assumptions for estimating surface erosion from hill slopes and roads. In collaboration with the mass wasting and geomorphology module leaders, he prepared the sediment budget for the watershed. He coordinated the preparation of a hydrologic base map, collection of local stream gage and precipitation data, and information concerning the hydrologic history of a 70-square-mile watershed. He completed peak flow analysis and an analysis to determine the effects of changes in canopy cover and rain-on-snow flow augmentation.

Flow measurement, Hydraulic Design, and Watershed Assessment – Mineral Exploration, Boise National Forest, ID. Mr. Johnson completed multiple tasks as part of the watershed assessment including permitting and design for culvert removal, evaluation of water availability, projected water use needs, an assessment of potential surface water storage and delivery infrastructure needs, and an evaluation of potential water right issues. Mr. Johnson developed the stream flow measurement program for the watershed. This effort included identifying key locations for flow data collection, developing and overseeing flow measurement protocol, and synthesizing and evaluating the collected flow data. He also provided senior technical review of the Stormwater Pollution Prevention Plan and completed an evaluation of potential runoff and erosion issues associated with proposed new access roads.

Sugar City Water Resources Assistance, Sugar City, Idaho. As the City faced development pressure, Mr. Johnson assisted the City with multiple efforts associated with water supply for the City. He completed a water facility planning study, assisted with procurement of funding, prepared the water and sewer infrastructure design and performed construction management for a

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21 acre business park. Mr. Johnson continues to help the City with water rights application, mitigation strategies, reviewing water supply needs for continued development, disposition of surface and groundwater rights, and other resource management decisions.

Lower Pony Creek Watershed Assessment, North Bend, Oregon. Performed hydrologic evaluation of flood flows in an urban area using the Santa Barbara Urban Hydrograph method. Performed hydraulic analysis of culverts and stream channel to evaluate flow capacity. Evaluated potential flood stage by routing hydrographs through wetland areas and tide gates. Provided recommendations for improvements to reduce flooding potential.

Additional Applicable Projects:

River Hydraulics, Geomorphic Evaluation of Channel Stability, Scour at Structures, and Sediment Mobility on the following:

- Chehalis River, WA
- Passaic River, NJ;
- Woonasquatucket River, RI
- Duwamish River, WA

Hydraulic Analysis for Bridge Designs:

- Garfield Ave Bridge, Idaho Falls, ID
- John Adams Bridge, Idaho Falls, ID
- Weiser River Bridge, Weiser, ID
- Enterprise Canal Bridge, Fremont Co, ID
- Del Rio Bridge, Fremont Co, ID
- Broadway Bridge, Boise, ID
- Medicine Creek Bridges, Clark Co, ID
- Texas Slough Bridge, Madison Co, ID

Bank Stabilization / Habitat Restoration Projects:

- City of Tacoma, Swan Creek Stream Restoration, Tacoma, WA.
- City of Tacoma, Habitat Restoration on the Thea Foss and Middle Waterways, Tacoma, WA.
- U.S. Army Corp of Engineers; Bridge and Boat Ramp Bank Protection, Kellog, ID –
- City of Tacoma; Middle Waterway Inlet Bank Stabilization, Tacoma, WA
- Kingston Property Bank Stabilization, Henry's Fork, ID

Project Site Water Management Planning and Drainage Design:

- Tajo Zacatoza, Coahuila, Mexico
- Cerro de Maimon, Dominican Republic